UNIVERSITY
OF MICHIGAN
JUN 23 1955
PERIODICAL
READING ROOM

ANNALS

of the Association of American Geographers

WALTER M. KOLLMORGEN
Editor

Volume XLV • Number 2

June, 1955

CONTENTS

Mackinder and the Course of Events ..... Arthur R. Hall 109

Rural Development in the Italian South: A Geographic Case Study
Robert R. McNee 127

Dynamic and Synoptic Climatology ..... F. Kenneth Hare 152

Abstracts of Papers Presented at the 51st Annual Meeting of the Association, Memphis, Tennessee, April 11–14, 1955 163

ANNALS of the Association of American Geographers is published quarterly in March, June, September, and December at the Business Press, Lancaster, Pennsylvania

Annual subscription: $5.00; separate issues of current volume and back numbers: 75 cents to $1.50

Address all communications relative to subscriptions, purchase of back numbers, etc. to A. A. G. Central Office, Map Division, Library of Congress, Washington 25, D. C.
Submit all manuscripts to
Walter M. Kollmorgen, Editor, Dept. of Geography, University of Kansas, Lawrence, Kansas

Statements and opinions in the ANNALS *are the responsibility of authors and do not necessarily reflect the views of the Association*

Entered as second-class matter August 2, 1934, at the Post Office at Lancaster, Pa. Acceptance for mailing at the special rate of postage provided for in the Act of February 28, 1925, embodied in Paragraph (d-2) Section 34.40 P. L. & R. of 1948.

ANNALS of the
Association of American Geographers

Volume XLV JUNE, 1955 Number 2

MACKINDER AND THE COURSE OF EVENTS

ARTHUR R. HALL
Silver Spring, Md.

AFTER reading his paper "The Geographical Pivot of History" in London on January 25, 1904, Halford J. Mackinder declared that it had not been his aim "to predict a great future for this or that country, but to make a geographical formula into which you could fit any political balance."[1] In the half-century that has since passed, Mackinder's thesis has been tested under varying conditions. Mackinder himself made two further statements of his formula, attempting each time to fit the prevailing "political balance" into it. Now that the Heartland power occupies a dominant position in world affairs, it may seem that the formula first propounded in 1904 has been proved correct. During much of this fifty-year period, on the other hand, the relationship of the formula to the world situation was not so clear. Although the role of the physical environment in shaping human destinies is perhaps not accepted so uncritically today as it was in the first years of this century, the making of geographical formulae to express man's reaction to his surroundings is still advocated by many. It may be useful, therefore, to trace the course of political events in their relation to the Mackinder thesis and in this way try to evaluate the great Englishman's attempt to make a geographical formula.

1904—THE FIRST STATEMENT

According to the 1904 analysis the most important strategical location in the world was the so-called pivot area—the northern and interior portion of the Eurasian continent where the rivers flow either to the icebound Arctic Ocean or inward to salt seas and salt lakes having no oceanic outlets. This pivot area was inaccessible to ocean commerce and sea power, Mackinder declared, but with the building of railways and the development of resources it was capable of becoming a seat of land power of overwhelming importance. Ranged around the pivot area was an inner crescent of continental states that were accessible to sea power and also open to invasion by the land power of the pivot area. Beyond this, on the islands adjacent to Eurasia and on the other continents was an outer crescent of "insular" states possessing sea power and inaccessible to the pivot area.

[1] Sir Halford J. Mackinder, *The Scope and Methods of Geography and the Geographical Pivot of History*, reprinted with an Introduction by E. W. Gilbert (London, 1951), p. 10.

Russia was the fortunate possessor of most of the pivot area. At that time she was no match for the states of the inner and outer crescents, but if some other strong power, such as Germany, should become allied with Russia the balance of power would be upset. The pivot state would then be able to spread outward over the lands of the inner crescent to the sea frontage, great fleets could be built, and the sea power of the insular states could be challenged. The "empire of the world" would then be in sight. Such an eventuality should cause the countries of the inner crescent to join the insular states, "and France, Italy, Egypt, India and Korea would become so many bridge heads where the outside navies would support armies to compel the pivot allies to deploy land forces and prevent them from concentrating their whole strength on fleets."

Any state controlling the pivot area was potentially great, and the various shifting alliances and combinations of power would tend to rotate around the pivot state. The substitution of some new power for Russia in this region would not alter the significance of the pivot area. If the Chinese, "organized by the Japanese," for instance, were to conquer the Russian portion of the area they would be a peril to the world's freedom because they would add the necessary oceanic frontage to the vast continental interior.

The nomadic horsemen and camelmen of the Eurasian steppes who had descended upon the surrounding civilizations periodically throughout recorded history were cited by Mackinder as illustrating the historical importance of the pivot area, and the Mongol dominion of the thirteenth and fourteenth centuries, extending from south China to Poland, was the prototype for his hypothetical empire of the pivot area. Russia, by extending her agricultural settlements into the steppe and by constructing the Trans-Siberian railway through the steppe corridor, was taking the place of the nomads, and horse and camel mobility was being replaced by railway mobility. The expansion of Russian land power had been the counterpart of sea power expansion by the countries of western Europe. The two types of expansion going on simultaneously had brought the entire planet under subjection, with the result that in the future there would be only one closed political system embracing all the world. The mobile land power of the pivot area would be opposed to the mobile sea power of the insular states.

Mackinder and his listeners were fully aware that he was not dealing in hypothetical cases when he spoke of insular powers joining to oppose the expansion of the pivot-area power. Throughout most of the nineteenth century Britain had opposed Russian attempts at expansion in the areas of the Turkish Straits, Iran, the central Asian approaches to India, and China. Sensing a common danger, the British and Japanese governments in 1902 entered into an understanding preliminary to the later Anglo-Japanese Alliance. Two weeks after Mackinder's paper was read the Russo-Japanese war began, and under the terms of the 1902 treaty Britain would have been obligated to join Japan in the fight if another power had intervened on the side of Russia. Mackinder quoted with approval the opinion of one of his listeners that the British military front stretched from the Cape of Good Hope through

India to Japan. If Britain had entered the war, areas within the British sphere of influence around the southern perimeter of Eurasia might indeed have become bridgeheads for a British attack on Russia just as Manchuria did become a bridgehead for Japanese attack.

The Russo-Japanese War demonstrated, nevertheless, that the great Slavic power was something less than a universal menace. Russia had become a giant in area and population, but because of her feudal social organization and retarded economic and technological development, her areal expansion had outstripped her strength. The sprawling Russian territories were vulnerable to the attack of Japan. The single line of the transcontinental railway linking the Russian capital with the Pacific, which in Mackinder's view was the precursor of a great era of mobile land power, proved too tenuous to prevent disaster for the Russians. We must hasten to add that in 1904 Mackinder had no illusions about Russian strength, and he thought of the growth of the pivot area mainly in terms of the future. We may nevertheless ask: If Mackinder's geographical formula could be applied generally and if the possession of the pivot area gave such great strength to the possessor, why were these facts not more apparent in the war of 1904–1905?

Mackinder pointed out correctly that the expansion of Europe had been responsible for encompassing the entire world in one political system, but this development in itself tended to decrease the importance of the pivot area for several centuries. During a period ending in about the early eighteenth century, political power in Eurasia was dispersed among the states of Europe and the several great empires extending from the Balkans to the Pacific. In the succeeding period the expansion of European peoples happened to coincide with the enfeeblement and decline of first one and then another of these great empires, and in turn contributed to their decline. The same story was repeated, with variations, in the states established by the nomads in the steppe, in the Mogul Empire of India, the Ottoman Empire, China, and other Asiatic states. By the late nineteenth century the former great empires of Asia had either become colonies of European countries or were subjected to European exploitation. Japan only was an exception, for she saved herself from European inundation by internal revival and the adoption of European techniques.

So long as the steppe lands were bordered on three sides by states of approximately equal strength and so long as the steppe nomads were able to strike in three directions at these states, the great central region of Eurasia could be considered as a pivot area in some respects. By Mackinder's time, however, not only the great central region itself but the Asiatic lands bordering it on the southwest, south, and southeast had become merely so many frontiers for European expansion. In important matters the peoples of these lands were no longer able to determine their own political destinies, for real power had passed to the European states. For the world as a whole, the several European great powers were the true arbiters of events (although the United States, Japan, and perhaps some other lesser states exercised determining influence in particular regions). In the closed political

system of the dawning twentieth century Europe was the center and other lands were peripheral.

Among the great European states there was one—Germany—that perhaps deserved to be termed pivotal. Located in the center of the constellation of Europe, Germany was both continental and maritime, agrarian and industrial. She had a rapidly expanding population, her industries were the foremost of the continent, and her overseas commerce was in a position to compete with that of Great Britain in many parts of the world. Generally speaking, the alliances and alignments of the period 1871–1945 revolved around Germany rather than around Russia, the pivot power of Mackinder. None of Germany's principal neighbors could attempt single-handed rivalry with her. They were either associated with her in friendly understandings, as in the case of Russia in the 1880's, in 1922, and in 1939, and Austria-Hungary from 1878 to 1918, or they were combined in alliances against her in attempts to restore the balance of power, as in the case of the Franco-Russian entente of 1895 and the anti-Axis alignment of World War II. Eventually most of the states of the world were forced to take their stand either for or against Germany.

The problem of Germany was the most fundamental one presented to British statesmen in the field of foreign affairs after about the turn of the century. Until near the end of Bismarck's tenure as Chancellor, Germany had remained essentially a land power and had not attempted to carry her flag overseas. Her traders and missionaries were active in many overseas areas, however, and by the beginning of the new century she had acquired a few colonies. She was ruled by a restless, ambitious emperor who was in a mood for further extra-European expansion. The fateful decision of 1900 to double the size of the German navy presented a challenge to Britain on the element where the latter had been supreme for over a century. It was disturbing enough to the British that Germans were out to acquire new spheres of influence and to capture markets formerly dominated by Britons, but as the German fleet increased in strength an even greater danger loomed—the prospect that in some future conflict the German fleet might be able to command the British home waters and starve Britain into submission.

Mackinder believed that Germany was potentially dangerous to Britain for a different reason—because she might join Russia and thus dominate Eurasia. Such an alliance was not beyond the realm of possibility. Germany, Russia, and Austria-Hungary had joined in the *Dreikaiserbund* of the 1880's, and not long afterward Bismarck had negotiated the reinsurance treaty with Russia. These understandings were mainly for the purpose of preserving the status quo in Europe, however, and they proved to be short-lived. Later, strenuous but unsuccessful attempts were made by Kaiser Wilhelm to secure an entente with Russia through his kinsman Czar Nicholas. By this time the policies and interests of the three eastern European empires were too divergent to permit any close understanding. Germany was forced to retain only her alliance with Austria-Hungary and to forego an understanding

with Russia. Germany was not, therefore, to be a danger to Britain because of a connection with the pivot-area power. It was true that Britain would shortly be menaced by a continental power with the capacity to build a great navy, but this power was Germany alone. She was sufficiently strong without Russia, and her colonial and naval policies presented potential threats in areas that were much more vital to Britain than the far-off pivot area.

For a time the German problem was obscured by the traditional rivalry between Britain and Russia and numerous other factors connected with Britain's world-wide commitments. Mackinder's uncertainty as to the ultimate role of Germany (as indicated by his suggestion that Germany might find an outlet for her energies in South America and thus be diverted from expansion toward the pivot area) was matched by that of British statesmen. Discussions were held between British and German officials from time to time in an attempt to reach an understanding, but these were always fruitless with respect to the larger issues separating the two countries. On the other hand, the old colonial rivalries between Britain and France were well on the way to settlement by the beginning of the century, and the same year that witnessed the reading of Mackinder's paper and the beginning of the Russo-Japanese War also saw the birth of the British-French *entente cordiale*. Three years later this understanding was expanded into the Triple Entente when Great Britain came to terms with France's partner, Russia, regarding the long-standing differences in Central Asia. Finding that she could no longer go it alone in a world where the growing strength of other ambitious powers was narrowing her own margin of safety, Britain chose to come to agreement with two old rivals regarding the peripheral areas of Africa and Central Asia in order to meet the challenge from the rising power in the center of Europe.

In the perspective of history, Mackinder's first statement of his thesis was untimely. He called attention to a rather remote danger from the great vacant spaces of central Eurasia during a transitional period in British policy when British statesmen were discovering that the traditional opposition to the possessor of these spaces was no longer suited to the world situation, and when both Great Britain and the central Eurasian power were finding increasing reason for cooperation in the face of the danger from Germany.

1919—THE SECOND STATEMENT

The strategic situation brought about for a short time near the end of World War I suggested to Mackinder that, with certain modifications, his pivot-area thesis still possessed validity. Germany defeated Russia and forced the revolutionary Bolshevik government to accept the Treaty of Brest-Litovsk in 1918. There was widespread suspicion among the Western allies that the Bolsheviks were preparing to collaborate with the Germans, and Great Britain, France, the United States, and Japan sent troops into European Russia and Siberia in support of counterrevolutionary movements. Superficially the situation was similar to that visualized by Mackinder 14 years earlier. Russia, it seemed, was in danger of subjection to Ger-

many and the insular powers were intervening to prevent this. The purpose of the second and more elaborate statement of the Mackinder thesis, made in *Democratic Ideals and Reality* in 1919, was to warn the peacemakers of the consequences of a failure to prevent either a German domination of Russia or a German-Russian combination of any type. A secondary purpose, arising out of the primary one, was to warn against an overgrowth of national or international power in any form and to suggest ways that such overgrowth might be prevented.[2]

In order to fit the original concept to the new purpose it was now necessary for Mackinder to enlarge the area stated to be inaccessible to sea power. In *Democratic Ideals and Reality* the pivot area is expanded to include all of the Tibetan plateau and the mountainous headwaters region of the great rivers of Southeast Asia, and this expanded pivot area is renamed the "Heartland." In addition, the Euro-Asia of the 1904 paper, plus Africa, now becomes the "World Island." There is also a new concept—"East Europe." The war had demonstrated that the Black Sea was inaccessible to Western sea power when the Turkish Straits were held by hostile and competent land forces. The British would not soon forget Gallipoli. German proximity to the Baltic entrance had also rendered that sea inaccessible to the Western navies. The drainage basins of the Black and the Baltic therefore constituted an area from which sea power could be excluded just as surely as it could be excluded from the Heartland. Mackinder termed this area East Europe, and he defined its western limit in rather general terms as a line extending from Denmark to the head of the Adriatic and passing slightly to the west of Berlin and Vienna. He declared that since the sea power of the West could be denied access to both East Europe and the Heartland the two areas should be considered as a unit "for purposes of strategical thinking."

This continental East Europe, said Mackinder, was set off from peninsular and insular West Europe by historical development. East Europe had served as a frontier for the Teutons who had expanded here at the expense of the Slavs and other peoples. In the mid-nineteenth century Russia had been powerful in comparison with the Teutonic states, but more recently the Germans and Austro-Hungarians had gained the upper hand. During the period of Russian ascendancy, Great Britain and France, the powers of the insular and peninsular West, were obliged to oppose Russia at the Straits and elsewhere, but after Russia had become relatively weaker than her Teutonic neighbors she joined in the entente with the Western powers in order to avoid subjection to Germany. In short, said Mackinder, "West Europe . . . must necessarily be opposed to whatever Power attempts to organize the resources of East Europe and the Heartland." The aim of the peacemakers must therefore be to secure a balance between German and Slav in East Europe that would prevent domination by either, but true independence for each. Mackinder then warned his readers:

[2] Mackinder, *Democratic Ideals and Reality, A Study in the Politics of Reconstruction* (2nd issue; New York, 1942).

Who rules East Europe commands the Heartland:
Who rules the Heartland commands the World-Island:
Who rules the World-Island commands the World.

One can scarcely quarrel with the proposition that a German-Russian combination would have been detrimental to the Western powers. The principal objection to *Democratic Ideals and Reality* is that the concepts of the Heartland and of the conflict between land power and sea power which are carried over from the 1904 paper and discussed at great length are rather tangential to the most pertinent point of the book. In the context of 1919 East Europe was by far the more important component of the East Europe-Heartland combination. In spite of steady growth in Siberia, European Russia was still the predominant part of the Russian dominions. Aside from the Allied intervention in the Russian civil war, the Heartland played a relatively minor part in the international politics of this period. Germany had already gone down to defeat without being able to exploit such riches as the Heartland possessed. The fruitless intervention in Siberia would be abandoned by the Allies before long. On the other hand, some of the most pressing problems confronting the world's statemen as they gathered to make peace concerned the disposition of the borderlands between the Teutonic powers and Russia. Germany and Russia together would have formed a dangerous concentration of power, but this would have been so even if the Heartland had been an uninhabitable, sandy desert.

Again, as in 1904, Mackinder attempted to counteract the prevailing tendency toward sea-power thinking. He pointed out that if the World Island should be unified under one command it would constitute a base for sea power so large that Great Britain and the other existing insular sea power bases would be unable to compete with it. This was certainly a latent danger that could not be ignored, but in an attempt to prove his point the British geographer twisted the history of the war into false shapes. By concentrating his attention on the last phase of the war, that is, the period after the collapse of Russia and the entrance of the United States, Mackinder attempted to demonstrate that the struggle was one between insular sea powers and continental land powers. The peninsular, or bridgehead powers—France and Italy—would have been unable to continue the fight to victory if they had not been supported by the insular sea powers, he asserted. Viewed as a whole, however, and contrary to Mackinder, the first World War was essentially a struggle of peripheral powers—Britain, France, Italy, and the United States on the West and Russia and Japan on the East, together with the many smaller states—against Germany, the true pivot power, and its central allies. The strength of most of the great states involved in the war was in fact amphibious. Russia and Austria-Hungary, possessing only insignificant naval strength in comparison with their strength on land, were the only exceptions. It is true that sea power supported France and Italy, but some of this sea power belonged to France and Italy, in particular to France. It is true that Britain, the United States, and the other insular allies bore the main burden of controlling the seas, but they also maintained armies on the Western front and these armies constituted land power of no mean propor-

tions. As for Germany, her naval strength was second only to that of Great Britain and gave the insular navies some very respectable competition.

Mackinder outlined in broad terms a territorial rearrangement which he considered would settle the problem of German and Slav in East Europe. He believed that a "Middle Tier" of states based on the submerged or recently liberated nationalities of the region should be created. This Middle Tier would extend from the Baltic to the Aegean and would separate Germany from Russia. Such an arrangement was already taking shape, of course, as the new states declared their independence, and it would shortly be sanctioned by the peace makers at Versailles. Mackinder therefore gave his blessing to a settlement that in the long run proved inadequate for the purpose that he had in mind. The establishment of the Baltic states and Poland pared rather deeply into the fringe territories of Germany and Russia but left the central areas, manpower, and resources of those two giants largely intact. On the other hand, the creation of Czechoslovakia and Yugoslavia, the enlargement of Rumania, and the separation of Austria and Hungary required the dissolution of the Austro-Hungarian Empire. The Hapsburg monarchy was an anachronism that was probably bound to pass away in any event. Its territory nevertheless represented a sizeable block of power in Central Europe that, by its mere existence, served as a partial balance against Germany and Russia. Mackinder ignored the importance of this ancient empire and considered it merely as a pawn of Germany, but when Austria-Hungary disappeared the fledgling successor states were no match for the two remaining great states of central and eastern Europe. All of this is clear to us now as a matter of hindsight, but it was also clear to some of Mackinder's contemporaries. One of these, for instance, stated that the new system of power distribution in East Europe was foredoomed to failure unless Germany was made to identify her interests with those of western Europe, and he warned against leaving the new states "between the upper and the nether millstones."[3]

In advocating the creation of the Middle Tier Mackinder overlooked a rule of thumb that had been used by statesmen on many occasions. According to this rule, if you fear your neighbor or covet some of his territory it is advisable to ally yourself to his neighbor on the opposite side. France had often found allies in the east against one or more of the Germanic powers, and Prussia and Austria had joined with Russia in the dismemberment of the old Poland. The formation of the Triple Entente to oppose the Central Powers on two fronts had been a recent example of the working of this rule.

The physical separation of Germany and Russia brought about by the Versailles system failed to produce the separation of interest whereby Mackinder hoped to solve the problem of East Europe. The Versailles system was scarcely three years old when Germany and Soviet Russia came to an understanding in the Treaty of Rapallo. The defeat and ostracism experienced in common by their two countries did more to bring Rathenau and Chicherin to a meeting of minds than had the feeling of im-

[3] Frederick J. Teggart, "Geography as an Aid to Statecraft, An Appreciation of Mackinder's 'Democratic Ideals and Reality'," *Geographical Review*, Vol. 8 (1919), p. 241.

perial kinship in the great days of Bismarck and Gorchakov or Kaiser Wilhelm and Czar Nicholas. The Rapallo *rapprochement* enabled the German army to regain a portion of its strength on the soil of interior East Europe and the Heartland, far from the prying eyes of the maritime powers. Again in 1939 the two powers came together in the Ribbentrop-Molotov pact for purposes of plunder, and the result was the utter demolition of the Middle Tier.

The creation of the Middle Tier of states was only part of a larger plan that Mackinder presented in his book for the division of the world into states of approximately equal strength. The economy of each of these states should be diversified and well-balanced. Each state should consist of federated provinces, and each province should have its own balanced economy and local culture. Mackinder thus hoped to disperse political and economic power among a large number of regional units. He seems to have had in mind a pyramid of federalisms, the balanced provinces being federated into balanced nations, and the nations being federated into a League of (balanced) Nations. He viewed the creation of the Middle Tier as the first step in the erection of such a system.

Bigness was the principal future danger in Mackinder's view, whether this be the bigness of states in East Europe-Heartland, or of international cartels, or of international labor unions, or of an international proletariat organized for revolution. The great state and its overgrown economic structure was a "Going Concern"—a giant machine whose momentum was such that it was in constant danger of destruction by collision with some other Going Concern in war or of disintegration in revolution. The societies of the world were in danger of becoming organized horizontally along international class lines because of the world-wide extension of business enterprises, and class warfare on an international scale might result. If economic and social forces were compartmentalized in medium-sized states and their self-contained provinces, these dangers would be lessened. The individual would be better integrated into the life of the community and his freedom would be better secured than under the prevailing system of big industry and big government. The differences between classes would become blurred and perhaps disappear. Mackinder, like Marx, was aiming at a classless society, but whereas Marx hoped to bring this about through world fusion of all workers, Mackinder hoped to accomplish it by an integration of all classes at the local and provincial level.

No concrete suggestions were made by Mackinder as to how such a system of states could be established. He realized that his proposal ran counter to the modern tendency toward concentration of power. He expressed the hope that Great Britain and her self-governing dominions and the United States would strengthen their prevailing forms of federalism. He thought that he saw indications that Prussia (Germany), which he considered "a purely artificial structure," and the Russian territories would be broken up into rather loosely federated states, but he had misgivings lest the current uncertainties and disorders in those two countries might merely pave the way for new strong men and tyrannical governments, for he considered that "the Russian, Prussian, and Hungarian plains, with their widespread uniformity of social

conditions, are favorable alike to the march of militarism and to the propaganda of syndicalism." These misgivings were justified, of course. The federal republic established at Weimar proved unequal to the stresses to which it was subjected, and the union of Soviet republics became a mere façade for the monolithic state run by the Communist party and Stalin.

Mackinder also did not grapple adequately with the problems of equal access to natural resources and of markets for the industries of his self-contained states. Presumably he would have allowed enough world trade to supply the industries of each state; but how could each medium-sized state with its medium-sized population support a well-rounded complement of modern heavy industries without imposing a crushing burden on its people? Mackinder does not enlighten us on this point. One presumes that *Democratic Ideals and Reality* was intended in part as a protest against an excessive indulgence in idealism of the Wilsonian type. One comes to the conclusion, nevertheless, that Mackinder's own "ideal" of self-contained states and provinces, which might have been suitable for medieval Europe or ancient Greece, was based on very little "reality" in the modern world.

Although the British geographer's proposed cure for the malady of bigness and class standardization could not have been adopted, it is to his credit that he correctly diagnosed the malady. He was no mere preacher of environmental determinism, for he understood the human motivations and conflicting social forces of the time. He believed that the uniform conditions in the Eurasian plain favored the spread of class struggle and tyranny, but he also warned that rapid communication and increasing standardization of life in the Western countries might contribute to the same result there. He understood that the danger of class warfare was not confined to any one region.

1943—THE THIRD STATEMENT

World War II opened with the consummation of a German-Russian alliance, the *bête noir* of Mackinder and the heart's desire of a whole school of German geopolitical thinkers. After the two allies had divided the Middle Tier between them it became apparent, nevertheless, that the alliance would not last. The Russians were singularly indifferent to the opportunity presented to them of allowing their Heartland to become a *Lebensraum* for Hitler's Reich. They had their own plans for the development of the Heartland—plans that did not envisage a semicolonial status for the Soviet Union and domination by Germany. On their part the Germans were incapable either of winning the treasures of the Heartland by diplomacy or of securing them by force. For the second time in this century it was demonstrated that when Germany was powerful and aggressive the chances for a durable German-Russian understanding were nil, and that Russia would be forced to cooperate with the Western powers in self-defense. The strategic situation after June 1941 was similar, therefore, to that in World War I. Germany and her European axis partners again occupied the central position and were confronted on all sides by a hostile alliance, although this time Germany was fortunate for a while in having Japan as an ally on the Pacific flank of her principal opponents.

The second war, on the other hand, resulted in a fundamental shift in the power balance and a change in the seats of power. Germany initiated a mobile type of warfare with planes, tanks, and motorized troop transport and was at first successful against the moderately large and small states that surrounded her, but she was no match for the giant states located in the outer portions of the hostile circle. The industries and resources of these giant states lay for the most part beyond the reach of German attack, either in North America or in the Eurasian Heartland; even the advance staging area of the Allies in Britain successfully withstood German air assault. Even France, defeated and occupied in the homeland, was able to furnish territories in Africa for the mounting of an anti-Axis offensive. Germany, in contrast, did not possess a large enough base of operations either to support sustained mechanized offensives or to provide dispersal and defense against mechanized attack, and she went down to defeat before the same type of air and ground assault that she herself had launched. Japan also possessed a base that was too small to sustain the conquests that she had undertaken. Japanese armies were unable to penetrate China in sufficient depth to insure the subjugation of that country; on the seaward side the forces of the United States, supplied from bases safely outside the range of the Japanese, were able to defeat the small-based army and navy of Japan.

Under the conditions of mechanized, three-dimensional warfare, the states upon whom victory depended were the ones commanding the greatest space for maneuverability, as well as sufficient resources and industries to sustain their effort, with these resources and industries far enough in the rear to be relatively safe from enemy attack. Command of the maximum space of land, sea, and air was necessary. The British Commonwealth, collectively, the United States, and the Soviet Union were the powers that met these qualifications in World War II. The war demonstrated that in the cramped quarters of continental western and central Europe it was no longer possible for even the larger states, much less the small ones, to maintain their positions independent of outside support. The power to act as arbiter of the world's destinies, which had rested so predominantly in western and central Europe since the eighteenth century, now passed outward in one direction to the Soviet Union and in another direction to the United States, with the Commonwealth barely able to retain its former position. Japan, when confined to her narrow islands, was in the same predicament as the continental European states. The development of nuclear weapons since 1945 seems only to have confirmed this trend. Most of the former great powers are now overshadowed by the super powers commanding the great spaces.

The final statement of the Heartland thesis, made during World War II, reflected the current hopes of the Western allies.[4] Mackinder once again defined the Heartland and, except for the exclusion of the portion of Siberia east of the Yenisei River watershed, this definition does not differ materially from that of 1919. The events of the intervening quarter century had not shaken his faith in the Heartland

[4] Mackinder, "The Round World and the Winning of the Peace," *Foreign Affairs*, Vol. 21 (1943), pp. 595–605.

concept, and he believed that it was more valid in the early 1940's than at any previous time. Considering the resources and manpower of the Russian Heartland, Mackinder predicted that if Germany were defeated the Soviet Union would become the greatest land power on the globe. In this last review, however, the Heartland was not looked upon as a citadel from which world conquest might be launched. The Heartland was viewed rather as one element in an alliance that would curb future German aggression. The other element, confronting Germany on the opposite side from the Soviet Union, would be an association of the principal powers of the "Midland Ocean," i.e., the North Atlantic. This association would consist of "a bridgehead in France, a moated aerodrome in Britain, and a reserve of trained manpower, agriculture and industries in the eastern United States and Canada."

Thus, only a few years before the cold war began, Mackinder seemed to abandon his 1904 assumption that future power alignments would revolve around his pivot area. By 1943 he believed that future alignments would follow the same pattern exhibited in the two world wars, and that the purpose of such future alignments would be to curb that old trouble-maker—Germany—rather than create a balance against the new greatest land power on earth—Russia. World War II caused such a fundamental change in the distribution of power that once again, as in the period 1904–1914, a Mackinder prediction proved to be incorrect in the short run. In the long run, however, the Mackinder of 1904 was to be proved more nearly correct than the Mackinder of 1943 dared to believe.

The defeat of Germany and Japan cleared the way for the assumption by the Soviet Union of the pivotal role in Eurasia. Indeed, the elimination of those two powers created the only conditions under which the Russian state could truly play such a role. In 1904 and 1919 it appeared to Mackinder that Heartland dominance might be brought about only through a combination of Germany and Russia, or possibly through a conquest of the Heartland by Japan and China. It is difficult to see how the Heartland could have remained anything but a peripheral area for a long time if either of these two possibilities had come to pass, for the center of power would have been outside the Heartland, either to the west or to the east. Because of the fortunes of war the success of the Heartland power has exceeded even Mackinder's expectations. The center of power is not in some outside capital, such as Berlin, Tokyo or Peking, but in Moscow, within the edge of the Heartland itself. The long oceanic coastline of China has now been linked to the resources of the Heartland, as Mackinder feared, but this has not been done under Japanese-Chinese leadership; it has been done instead by a government in mainland China that, if not a complete puppet of Moscow, is at least a willing ally and follower. Germany has been partitioned and that portion lying within Mackinder's East Europe is under the Soviet heel. The first line of the famous three-line warning is now reversed:

> Who rules the Heartland commands East Europe.

The Soviet power system was rapidly taking shape at the time of Mackinder's death in 1947, and its present areal form was completed some three years later by

the Communist triumph in mainland China. In areal extent the Soviet orbit resembles that of the Mongols. Including the Soviet Union, the European and Asiatic satellites, and the Chinese ally, the orbit embraces most of East Europe-Heartland, plus a considerably larger area. It is true that a number of states—Finland, Sweden, Yugoslavia, Turkey, Iran, and Afghanistan—lying wholly or partly in the East Europe-Heartland area are not part of the Soviet orbit, but counterbalancing these is the large portion of China lying outside the Heartland yet a part of the Soviet power complex.

The strength of the Soviet Union in relation to that of the other large states has increased immensely and the relative importance of the Heartland within the U.S.S.R. has increased. At the end of the nineteenth century there were some 51 million persons in the Russian Heartland, whereas an informed guess places the recent population of the region at about 87 million.[5] The region has not only experienced an impressive growth in agricultural production, but its heavy industry has also increased. In 1951, according to assertions made at the nineteenth Communist Party Congress, the Urals and areas farther east produced 44 percent of the total pig iron and slightly over one-half of the total steel of the Soviet Union.[6] On the other hand, it must be admitted that Mackinder was a bit over-optimistic when he stated in 1904 that "the century will not be old before all Asia is covered with railways." It is clear that the development of the Russian Heartland has taken the direction foreseen by Mackinder, although it cannot be said that his forecasts have as yet reached complete fulfillment.

In spite of the great increase in Soviet power, the time, imagined by Mackinder, when the balance of forces would be completely upset, has not yet come, and the primary reason for this has been the determination and the ability of the United States to maintain a balance against the Soviet orbit. The function of the United States in today's balance of power demonstrates one of the principal weaknesses of the Mackinder thesis. Impressed with the fact that the area and population of the World Island was much greater than that of the combined insular areas, Mackinder assumed in his two earlier statements that if all or a large part of the World Island should be united under one rule the insular states would be no match for this aggregate of power. This line of reasoning led him to underrate the importance of the insular areas in general and of Anglo-America in particular. Only in his third statement did Mackinder finally acknowledge the importance of Anglo-America.

The United States was a late arrival among the great powers, but her growth took place at a more accelerated rate than that of Russia. As Russia was inaccessible to sea power and, to a somewhat lesser extent, to the land power of Western

[5] Derived from data of the 1897 census in S. S. Balzak, V. F. Vasyutin and Ya. G. Feigin, *Economic Geography of the U.S.S.R.* (New York, 1949), pp. 517–519; and 1947 estimates in Theodore Shabad, *Geography of the U.S.S.R., A Regional Survey* (New York, 1951), pp. 499–505.

[6] New York *Times*, October 27, 1952, p. 6.

Europe, so the United States was inaccesible to the land power of the Old World. Situated outside the constellation of Europe, yet near enough so that she was not completely isolated, the United States was able, after 1815, to grow to full stature without interference. She was protected from Europe not only by her own strength, by the seas, and by the generally benevolent attitude of the British fleet on those seas, but also by the rivalries among the great powers. None of the continental powers could ignore potential enemies in Europe long enough to succeed in an American adventure. Not even Britain, whose world-wide commitments included the possible defense of an exposed flank on the Canadian border, could afford to be tied down by prolonged quarrels with the United States. As the movement of Russians southward and eastward filled the Eurasian steppe with an agricultural population and carried Russian sovereignty to the Pacific, so the corresponding movement of Americans westward filled the great interior of North America and carried United States sovereignty to the Pacific.

The area and population of the United States remained smaller than that of Russia, to be sure, but by the beginning of the present century the United States was far ahead of Russia in industry and technology. The Russian railway net was slow to develop, but the United States furnished the prime example of mobile manpower, whether civilian or military. This mobility extended to the surrounding seas, for the United States had been a maritime nation from its inception. The land power of Russia has played a decisive role in world affairs on several occasions; in her short history the United States has twice played a decisive role on both land and sea. In the first World War the United States supplied the margin of strength necessary for the victory of the Western allies in Europe, and in the second World War she was mainly responsible for preparing and executing victory on both the eastern and the western margins of the World Island. For the sake of self-preservation the United States, like Great Britain, has opposed any power or combination of powers that has threatened to dominate Europe and Asia, and has supported the other Eurasian states leagued against the aggressor.

Fortunately, the northern part of North America is the seat of a nation whose interests have generally coincided with those of the United States. Canada, like the United States, was free from continental European interference, and the Canadian advance westward was in many respects the mirror image of that taking place to the southward. After an initial period of rivalry along their common frontier the Americans, Canadians, and British found that their interests ran parallel and, for a period dating certainly from about 1917 if not before, they discovered that their interests throughout the world were common. We are justified, therefore, in speaking of an Anglo-American heartland. This heartland, set in the midst of the oceans rather than in the center of a great land mass, is the principal source of strength of the present free world alliance.

In the face of the threat from the Eurasian Heartland, a system of defensive alliances and agreements has been created that resembles in some respects the alignment of the insular and the bridgehead states suggested by Mackinder in 1904. At

the moment of writing this alliance system is being subjected to strains because of differences of opinion among the allies, but the fact that the system was brought into existence in the first place is significant. The system embraces most of western Europe. It extends eastward in a narrow belt separating the southern flank of the East Europe-Heartland bloc from the Mediterranean to cover the Black Sea entrance, and northward in another narrow belt to cover the Baltic Sea entrance and the passage between the North Atlantic and the Arctic Oceans. France and Italy, the two European countries named by Mackinder in 1904 as possibly playing the bridgehead role, are members of this system. In the Pacific several insular states lying off the coasts of the World Island are also members. The purpose of the alliance system is not limited merely to forcing the Heartland power to deploy armies and thus prevent it from building great navies, as Mackinder suggested, for in this time of three-dimensional warfare coupled with ideological struggle the emphasis on sea power alone has lost its significance. In the Far East the bridgehead country named by Mackinder has in fact been the scene of combat. Here, in Korea, the United States joined with sixteen other countries of western Europe, the Pacific, Africa, and the Americas in supporting United Nations action to repel Soviet bloc aggression. On the other hand, Britain has cut her commitments around the southern margins of the World Island and she is no longer able to maintain bridgeheads on this flank of the Heartland power as she could in Mackinder's day. Here the Republic of India and the Arab states seek to pursue policies that are independent of both the Western countries and the Soviet bloc, and Pakistan appears to be the only state as yet ready to join the Western system of agreements. Mackinder did not discuss the possibility that the Heartland power would try to penetrate southward by way of Indochina, but his thesis certainly did not exclude such a possibility.

Mackinder understood in 1919 that ideological struggle would become increasingly important, but he was in no position then to foresee the present issue of the struggle. The Russian Communists secured a new and powerful weapon for the arsenal of their Heartland fortress when they posed as the champions of the world proletariat and of peoples toiling under the yolk of Western colonialism. It was no longer necessary for the Heartland power to rely on military might alone to penetrate the inner crescent or the insular areas. After a generation of persistent subversion, temporary retreats, and sudden advances, Communist imperialism has been richly rewarded. In portions of the Soviet orbit Communist dominance is due mainly to the presence of the Red Army, but subversion and revolution, unsupported by direct Soviet military intervention, were responsible for the Communist triumph in China. Recent events have shown the appeal of the Communist siren-song among peoples in western Europe, portions of the Americas, and southeast Asia.

The ideological weapon performs for the Soviet state somewhat the same function as that performed by the parachute division for an army. It secures positions in advance of, and isolated from the main body of "troops," and disrupts the normal procedures in the rear of the "enemy." In the early part of the century it appeared

to our political geographer that the Heartland power would be a threat to the insular states of the outer crescent because of its ability to build overwhelming fleets. With the ideological weapon, however, the Soviet type of imperialism can make serious inroads in such places as Middle America without the necessity for sending even one destroyer.[7]

In the meantime the principal ideological weapon available to the West is not used to full advantage. The belief in the inherent dignity and worth of the individual is a cardinal principle of Western culture, but the large measure of freedom which the Western peoples enjoyed as a result of this belief gradually came to be accepted complacently as belonging to the natural order of things rather than something requiring eternal vigilance. Now that Communism has enslaved its millions under the guise of creating Utopia, the real value as well as the real price of liberty is again becoming apparent. The uprisings in eastern Germany and the continuing defections from Soviet orbit areas make it clear that most of the peoples behind the Iron Curtain do not willingly submit to their bondage. The West does not have to rely entirely upon military might either to prevent further advances of the Heartland power or to reclaim areas now behind the Curtain, for positive and skillful use of the ideological weapon of freedom could do much to accomplish this result.

What have current developments in air power and the atom and hydrogen bombs done to the concept of the Heartland as an area of inaccessibility? Fifty years ago, or even 35 years ago, it was possible to define with some degree of accuracy an inland area which, if reasonably well defended, could be considered as inaccessible to the maritime powers. Then, as throughout all previous history, the effectiveness of ships, as ships, ceased only a short distance inland from the water's edge. These conditions of warfare remained fairly stable. Even in the era of surface warfare, however, the size of the area of inaccessibility varied from time to time with the relative strength and deployment of the assault forces and the forces of the defenders. Mackinder recognized this when he added East Europe to his original pivot area.

In the era of air warfare the outer boundaries of the inaccessible region must be considered completely fluid. Developments in aviation have been so rapid that planes of a given speed and flight radius become obsolete in a short time and are replaced by planes of greater speed and radius. Access to particular areas can still be denied to surface armies and navies by forces of the same type, but for strategic air forces the day may be approaching when all areas of the earth's surface will be accessible, at least in theory, to all other areas. At the same time the development of defenses against aerial attack keep pace (or attempt to keep pace) with the developments in aviation. Possibly an effective defense system can be erected against the intercontinental bomber carrying atom or hydrogen bombs, or even against the intercontinental guided missile, and probably there will still be cer-

[7] The report that a Soviet submarine supplied arms to would-be rebels in Nicaragua does not alter the general truth of this statement.

tain strongly-defended areas on the globe from which enemy air power can be excluded. At present, nevertheless, any definition of an area of inaccessibility remains valid only until new, farther-ranging planes are developed that can push back the frontiers of the area or until techniques are evolved to penetrate or elude such defenses as the area may contain.

The Heartland is no longer a fortress from which the forces of the insular powers can be barred. The vast plains and mountains that gird it can now be flown over. The ice-locked waters to the north are no longer excluded from strategic thinking as impenetrable. It is still too early to characterize the Heartland as completely vulnerable to the outside powers, but the quality of inaccessibility is rapidly diminishing. The significance of the Heartland now lies less in its fortress aspects and more in its resources, location, and manpower. But if this can be said of the Eurasian Heartland it can also be said of the Anglo-American heartland. We are obliged to assume that the air strength of the Soviet bloc at least keeps pace with our own. The oceans no longer furnish the same protection to Anglo-America that they once did, and the Arctic ice can be crossed by Soviet planes as easily as it can by Anglo-American. The two heartlands face each other across the pole.

CONCLUSION

In spite of Mackinder's denial that he had attempted to "predict a great future for this or that country," his thesis in its several presentations has been most correct because of the very fact that it was such a prediction. Russia has developed within her frontiers and her influence has expanded outward into surrounding lands in accordance with the Mackinder theories. The vicissitudes of war and politics that cleared the way for this expansion were not foreseen by the British geographer, nor were the mechanisms used in the expansion similar in all respects to those discussed by him, but the results have confirmed his speculations.

Viewed strictly as a "geographical formula into which you could fit any political balance," on the other hand, the thesis must be rated as unsuccessful. The analysis by which the formula was derived was faulty in two respects: first, the area chosen as the most important seat of power had not in fact played a pivotal role in world history during a long period of time; and second, the existence of another heartland in Anglo-America was overlooked, and this heartland was capable of occupying as important a place in planetary affairs as the one in Eurasia.

No correct analysis leading to this type of geographical formula was possible because the idea of such a formula was wrong in the first place. The factors of location, terrain, natural resources, and a numerous and industrious population do not in themselves destine a region to become a seat of world power. The power position of a region at any given time depends also upon its cultural and historical development in relation to that of neighboring regions, relative advancement of its technology, efficiency of its political organization, effectiveness of its leaders, *esprit de corps,* and other factors too numerous to be taken into account in any formula.

Changes in relative power position such as we have noted for the Heartland and western Europe could be cited for every other region that has at one time or another been a seat of world power. Europe, which was the cradle of our Western culture and for long the center of world political power, is now overshadowed by giant states that were at one time on the margins of European civilization. This phenomenon of the passage of political hegemony outward from the small states at the center of a culture to giant states on the periphery occurred in earlier periods of history also.[8] To all present appearances there will be no relative decline in the power of the Heartland in the near future, but the current eminent state of the area was not foreordained nor is it frozen by geography. Aside from defeat in war, a few circumstances suggest themselves in which such a relative decline might take place. The Soviet Union might suffer a relative decline in its influence if the peoples of the earth might somehow, by experience, or through an ideological counter-offensive by the West, become convinced of the spuriousness of the Communist philosophy. A relative decline in the importance of the Soviet Union might also take place if a system of multiple super powers should arise replacing the former system of multiple great powers. If China should continue to develop in strength and break away from the Soviet orbit, and if the states of western and central Europe should finally bring themselves to a pooling of their sovereignty, two super powers might be established in addition to the present ones in Anglo-America, the British Commonwealth, and the Heartland, and Russia would be only one among several equals.

Finally, "improvements" in the art of warfare have made it impossible to derive a permanent geographical formula concerning political power. The strategic bombing plane has greatly altered the concept of areas of inaccessibility.

Mackinder's bold and stimulating theory caught the popular fancy in several countries—in Germany following the defeat of World War I and in the English speaking countries during and since World War II. Before 1945, however, it was not the kind of theory that could inform the practical, day-by-day and year-by-year formulation of policy by national leaders. The practitioners of *Geopolitik* in Munich who hoped to apply a derivative Mackinder-theory-in-reverse to the advantage of Germany reaped only frustration and defeat. The action program which Mackinder himself advanced at the end of World War I was either inadequate for the purpose or was entirely impractical. The alliance system which he had earlier advocated to cope with the threat of an expanding Heartland resembles the system which was finally created only after his death, because only then did the danger from the Heartland become sufficiently great to require such a system. Mackinder had written: "Time is of the essence of international policy; there is an opportunism which is the tact of politics." During his lifetime his thesis did not possess this opportunism.

[8] The phenomenon is discussed in detail in Arnold J. Toynbee, *A Study of History* (London, 1945), vol. 3, pp. 302–305, 310–312.

RURAL DEVELOPMENT IN THE ITALIAN SOUTH: A GEOGRAPHIC CASE STUDY

ROBERT B. McNEE
The City College of New York

ITALY has launched a vast ten-year (1950–1960) development program in the underdeveloped *South*. This two billion dollar program, directed by a new regional authority (*Cassa per il Mezzogiorno*), has absorbed and expanded pre-existing land reclamation plans and has added a sweeping agrarian reform. The plan concentrates especially on a relatively few small reclamation zones of outstanding potential (Fig. 1).[1] This study accordingly focuses on a representative member of these favored zones, Metapontino[2] in the instep of the Italian Boot.

Metapontino (417 square miles; 1951 population, 58,790) is one of the most important of the land reclamation-land reform areas, both in apparent potential and in plans for development. Reclamation and reform seek to increase productivity and improve living conditions by altering present-day man-land relationships. Therefore this paper first analyzes existing and potential relationships among three related variables: land, population, and rural economy. Reclamation and reform are then considered in terms of the contribution each is making toward the development of Metapontino. Communal differences are emphasized since each commune is a relatively separate economic cell in the present economy.

THE LAND

Though extraordinarily diverse in other land qualities, Metapontino is broadly uniform climatically. Winters are cool and wet; summers, hot and dry. Mean annual rainfall is about 20 inches, variable within 20 per cent. Seasonal droughts are common, especially in the spring. Non-irrigated crops are therefore highly vulnerable. Two seasons of growth are separated by two of relative dormancy: spring growth, summer dormancy, fall growth, and winter dormancy (approximately 13, 19, 10, and 10 weeks respectively). Thus for most non-irrigated crops the growing season is limited to about 23 weeks, interrupted by a summer hiatus. However, with irrigation the season is extended to almost all of the year.

Metapontino differs markedly in other land qualities. Side by side with extremely fertile and promising plains are eroded badlands as desolate and sterile as can be imagined. These differences are summarized in five major terrain types: sand dunes, river flood zones, alluvial plains, gravelly hills and plains, and clay hills (Fig. 2).[3]

[1] Based on ECA, Special Mission to Italy, "Acceleration and Concentration Projects," 1951, Rome.

[2] Metapontino takes its name from the reclamation project which in turn derives from the ruins of *Metapontum*, ancient city of *Magna Graecia* on the coastal plain.

[3] Field mapping by author at 1:50,000.

Sand dunes and river flood zones fortunately include only about 3 and 6 per cent, respectively, of Metapontino. The sands, however, tend to migrate onto the adjacent alluvial plains. Wide river areas along the Sinni and Agri Rivers are

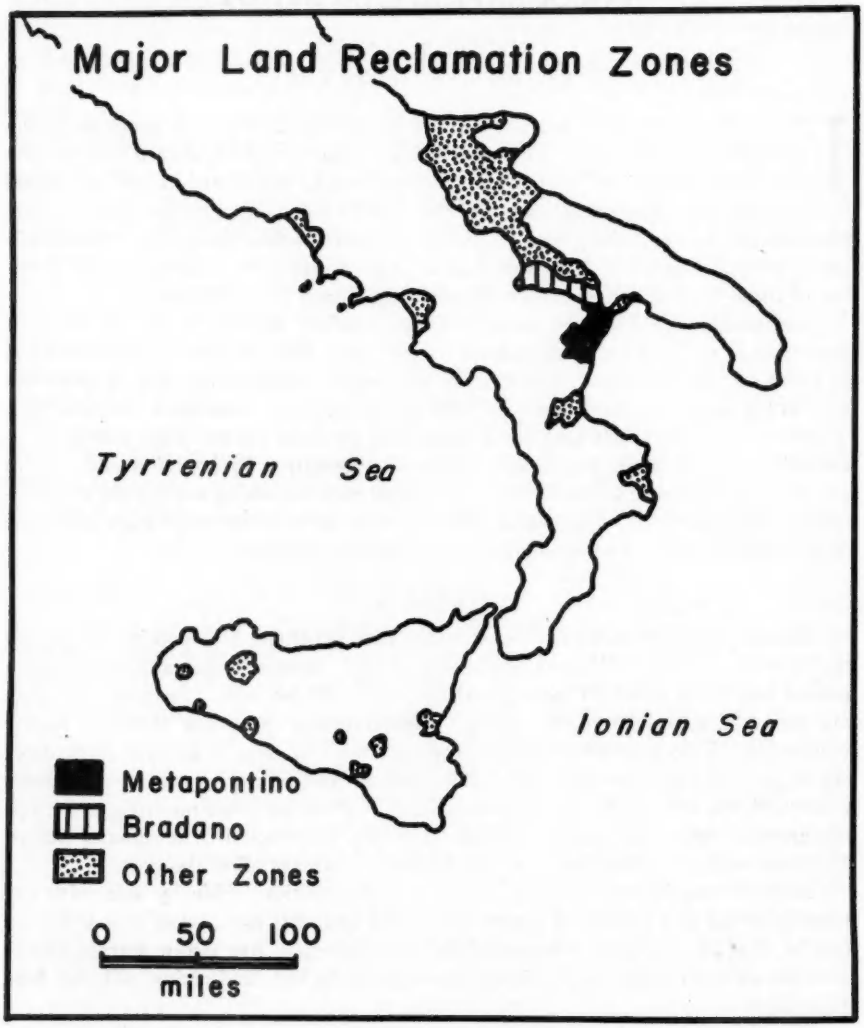


FIG. 1.

seasonally flooded, but normally barren. Such areas have proven highly fertile on the fringes where flood protection is provided. Though the rivers are nearly dry

in summer, total annual stream flow is sufficient for the irrigation of the coastal plains and there are several valley constrictions available to be used as natural dam sites.

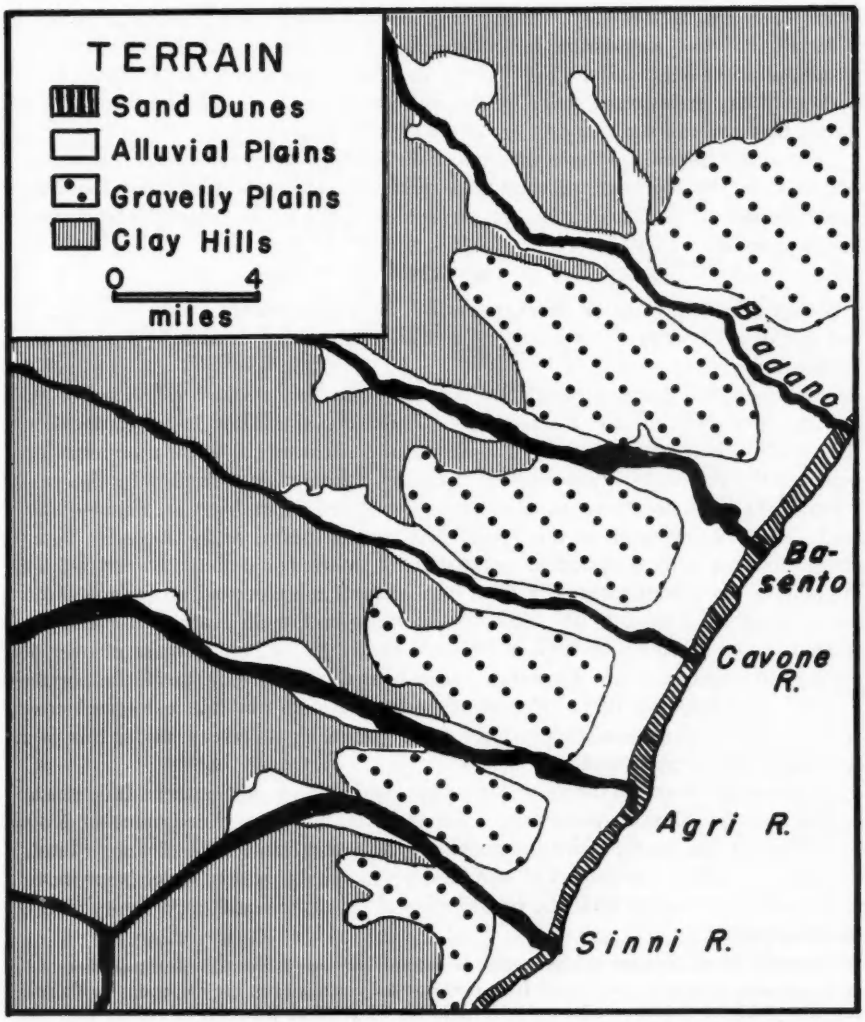


FIG. 2.

The clay hills of the interior are very steep and much eroded, and consequently are of only minor agricultural value. Covering about 40 per cent of Metapontino,

these interior lands include extensive badlands adjacent to the villages, areas of almost complete desolation.

The coastal half of the area is divided almost equally between alluvial and gravelly terrain. This fertile coastal plain is the great land asset of the seven communes which make up Metapontino. Formerly mosquito-ridden and malarial, this band is today the solid foundation for a new agricultural development, a foundation paralleled in the *Mezzogiorno* only by the Tavoliere, Sele, and Sibari Plains. Even with only dry cultivation, potentialities are great; with irrigation from the five rivers, they are extraordinary.

The seven communes share very unequally in this high quality land. It is concentrated in the four eastern communes and it is almost absent from the three western ones. This disparity is a major problem in the realization of Metapontino's bright promise.

POPULATION

Metapontino's population is characterized by rapid growth, wide variation in density, marked village concentration, and an occupational pattern typical of *latifundia* zones.

Metapontino's modern population growth is an exaggerated reflection of the pattern throughout all the *Mezzogiorno*. For fifty years after Italian unification, 1871–1921, Metapontino remained an economic backwater. Population numbers were nearly stationary, even slightly declining. Emigration swelled in the peak years, 1900–1915, to a true rural exodus, disordered flight from an impoverished land. At least one-sixth of the *Metapontini* settled permanently abroad. Today emigration has been dammed at its source by internal and external restrictions. Population has soared, primarily from local natural increase and secondarily from surrounding rural areas.[4] By 1931, Metapontino had again reached the numbers of 1871, about 40,000. In 1951, there were nearly 59,000, an increase of over 45 per cent in twenty years.[5] Continued increase at this rate would swell the population to over 84,000 by 1971. For Metapontino, through millenia a deserted coast and only recently quasi-abandoned for more promising overseas lands, this is a remarkable prospect indeed.

Metapontino is one of the most thinly populated areas in all Southern Italy; mean density is only 141 per square mile. Yet the hilly and eroded commune of Nova Siri (Fig. 3) has nearly twice the density of adjacent fertile Montalbano. Traditional farming organization, social attitudes, governmental regulation of labor movement, and other factors limit the equalization of population and opportunity among the communes.[6]

[4] Local officials estimate the crude rate of natural increase at from 12 to 15 per thousand; many permanent migrants have come from overcrowded communes in the mountains in Potenza and the plains of Apulia; undeterminable numbers of political prisoners remained after the Fascist concentration camps were eliminated.

[5] Istituto Centrale di Statistica, *Primi Risultati dei Censimenti* (Roma, 1952), pp. 68–69.

[6] Communal densities as follows: Bernalda, 220; Nova Siri, 187; Pisticci, 159; Rotondella, 140; Montescaglioso, 132; Tursi, 100; Montalbano, 97.

Metapontino has three main population groupings: hill-villages, cottage zones, and ranch (*Masserie*) zones (Fig. 3).[7] The centers of community life, the seven

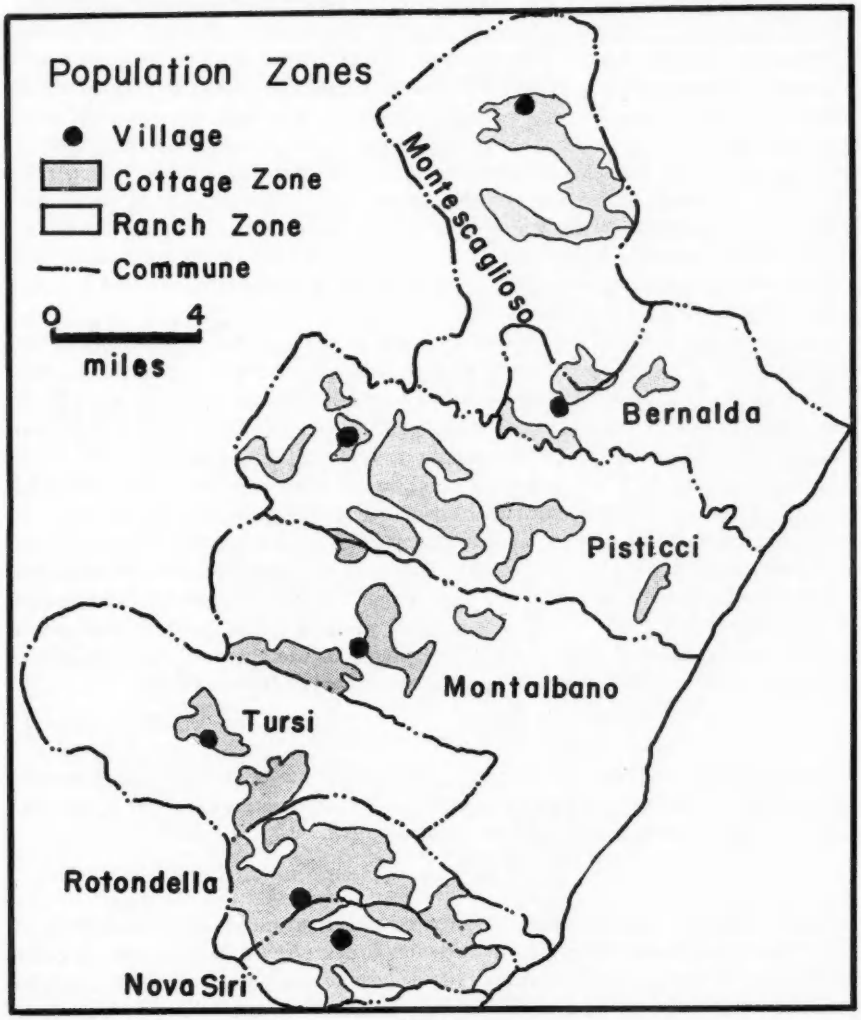


FIG. 3.

hill-villages, have 88 per cent of the population, i.e., about two-thirds of the peasants and nearly all of the service community. Clinging to ancient fortress sites, distant

[7] Field mapping by author at 1:50,000; estimates of population from census data, interviews, and field mapping of habitations.

from the fertile coastal plains, these villages are very poorly situated for the development of Metapontino. Though the cottage zones of dispersed peasant homes include only 4 per cent of the population, they are very important to the developing peasant economy. Cottage settlement is most important in Nova Siri. To the westward in Calabria and Potenza such dispersed settlement is of major importance. But most of Metapontino is normally barren of population except at isolated ranch centers. Many of these are very large. Policoro, for example, has about 600 residents and the services of a small village. Nearly all of the coastal ranches have 50 or more permanent residents. Interior ranches are normally smaller. Two railroad stations, Nova Siri Scalo and Metaponto, have brought limited additional services and population to the coastal plains. The ranch zone, including the fertile coastal plains, has only 8 per cent of the population. However, both ranch and cottage zones provide nuclei for dispersal out of the villages in the hills and a closer relationship to Metapontino's best lands.

Metapontino's occupational pattern is typical of the great *latifundia* zones of the *Mezzogiorno*. About 40 per cent of the population is actively productive, in four major groups: agriculture (75 per cent), crafts (15 per cent), commerce (5 per cent), and administration and social service (5 per cent). The potential contribution of the agricultural labor force can be roughly estimated at 4,435,000 work days,[8] of which nearly 5 per cent is supplied by net labor immigration.[9] About 75 per cent of the agricultural workers form a true rural proletariat. One-third of these are semi-skilled herdsmen or mechanics, hired by the ranches (*masserie*) on renewable yearly contracts. Two-thirds, however, are unskilled and are employed only erratically, usually less than 150 days a year. Some supplement their income by operating small plots during unemployed periods. This predominance of a partially employed rural proletariat is not unique to Metapontino, or even to the *Mezzogiorno;* few areas, however, surpass the extremes here indicated.

RURAL ECONOMY

Metapontino's economy is dominated by extensive and destructive land use, contrasting and conflicting land holding methods, extreme variations in types of farming units, and acute seasonal and endemic unemployment.

Land Use

Agriculture is overwhelmingly devoted to wheat farming; other production is minor and dependently related to it. About 60 per cent of Metapontino is cultivated (Fig. 4[10] and Table I). About 90 per cent of this area is in sown crops, in a simple three-year rotation of 1) wheat (in minor areas, tobacco), 2) wheat

[8] A work day is a full eight-hour day of labor by an able-bodied male, 15 to 65; adult female labor is valued at 60 per cent, and that of children correspondingly less.

[9] Local workers estimated from the censuses of 1936 and 1951, using 250 work days annually per worker; net labor immigration calculated from unpublished data provided by communal labor offices and the Ministry of Labor, Rome.

[10] Field mapping by author at 1 : 50,000.

(sometimes oats, horse beans, or minor crops), and 3) fallow (sometimes horse beans or weedy pasture). Yields are low for a European area, averaging only 15, 18, and 12 bushels per acre for wheat, oats, and horse beans respectively. Thus, since

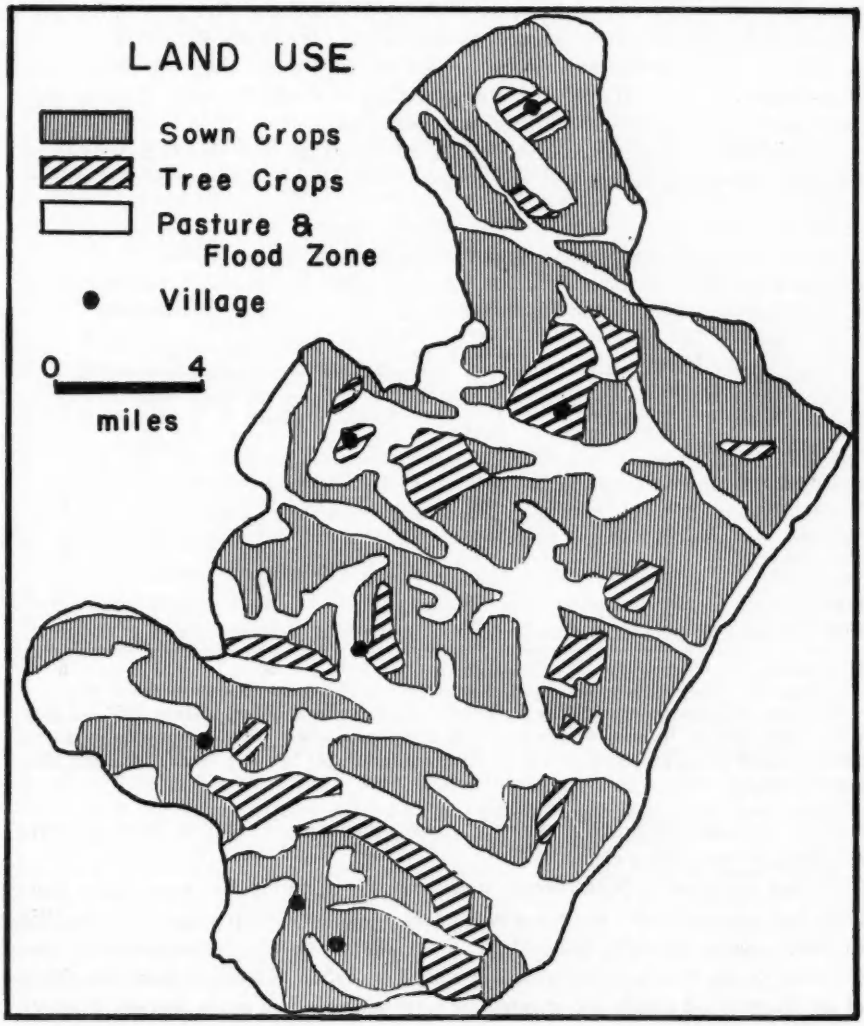


FIG. 4.

one fourth or more of the land is normally fallow, over-all production is necessarily very low. *Pane, pasta,* and *fave* are indispensable to peasant diets; wheat and beans, ubiquitous on peasant lands. For the ranchers, wheat is the major cash crop.

Only 10 per cent of the cultivated area is in tree crops, in three types of areas: village *coronas,* ranch olive groves, and irrigated gardens. The *coronas* are areas of intensive peasant production of tree crops, grains, and vegetables for family consumption. Though many of the coastal ranches have ancient olive groves, few produce other tree crops. The peasants of Montalbano and Tursi have cooperatively developed rudimentary seepage irrigation in two small zones along the flood plains of the Sinni and Agri Rivers. Limited quantities of the high-quality Tursi orange produced in these irrigated "gardens" are sold abroad.

Metapontino's formerly relatively extensive forests are now almost entirely gone. Probably one-fourth to one-half was originally forested, judging from the solitary

TABLE I

LAND USE IN PERCENTAGES OF COMMUNAL AREAS, 1952*

Communes	Uncultivated Lands				Cultivated Lands		
	Unproductive (Flood Zone)	Pasture Land			Sown Crops		Tree Crops
		Quasi-waste	Grass & Scrub	Forest	Alone	With Tree Crops	
Bernalda	6	1	18	..	64	3	7
Montescaglioso	3	3	29	..	57	3	6
Pisticci	5	5	36	..	43	4	6
Montalbano	6	3	31	7	46	1	7
Tursi	11	6	32	5	42	2	3
Rotondella	14	3	18	3	43	17	3
Nova Siri	6	4	13	2	54	18	4
Metapontino	6	4	28	3	50	3	6

* Based on estimates provided by the Provincial Agricultural Office, Matera, 1952. Definitions: *unproductive:* house sites, roads, stream beds; *quasi-waste* (*incolti produttivi*): pasture areas annually producing less than 176 lbs. of green forage per hectare; *forest:* including some areas of scrub.

sentinel oaks of the gravelly plains.[11] The remaining forests, in areas of river seepage, are now being cleared.

About one-third of Metapontino is still *maquis* pasture. For over thirty years grain has been gradually replacing *maquis,* even on very steep slopes. From 1930 to 1952, animal numbers declined by about 20 per cent.[12] Transhumance, once the basis of the ranch economy, finally ended in 1952. Today at least two-thirds of the animal food supply is consumed by work animals, i.e., mules, horses, donkeys,

[11] The most severe effects of summer drought are apparently overcome by high water retention in the gravelly soils.

[12] Estimated by the provincial agricultural office from the agricultural census and corrected tax lists.

and oxen. Sheep are significant primarily as ranch scavengers. Goats and swine are important on peasant units.

About 10 per cent of the land is waste, i.e., riverbeds, flood zones, and the badlands of the clay belt. Both the Sinni and Agri have braided channels, normally barren. The badlands are almost totally barren and are kept so by constant grazing and erosion.

Land Holdings

Before Italy's great land reform began in 1950, few areas could match the extremes in private land holding of Metapontino (Fig. 5).[13] Remaining common lands were extensive, much more extensive than normal in the South. Private land holdings are primarily very small (12.5 acres or less) or very large (500 acres or more); moderately sized holdings are rare. Fragmentation is almost universal for holdings of less than 125 acres, but very rare for large holdings. Therefore, 125 acres may be used as the approximate statistical dividing line between the two great land holding extremes.[14] The three zones (common lands, *latifundie,* and the fractionized zone) differ markedly, not only in the sizes of individual holdings, but also in areal patterns of size variation, fragmentation, and stability of ownership.

While the fractionized holdings may be as large as 125 acres, 50 per cent of the zone is in tiny holdings of less than 12.5 acres and 88 per cent is in holdings of less than 50 acres. Sizes generally increase radially outward from the village center. Parcelization is extreme, and the parcels (*particelli*) widely distributed. Mixed ownership is common; more than half the holdings have two or more owners and many have five or more. Ownership is highly unstable, due to the divisive inheritance system, limited peasant assets, and persistent over-extension induced by land hunger.

Over 50 per cent of the *latifundia* zone is in 8 great estates, each of thousands of acres; the largest, Policoro, is larger than the adjacent commune of Nova Siri. The largest holdings are concentrated on the coastal plains. Both parcelization and mixed ownership are exceedingly rare. Ownership is highly stable, indeed almost rigid, due to the social prestige of land ownership and the lack of a true land market.

About 35 per cent of Metapontino is in fractionized holdings, 57 per cent in *latifundie,* and 8 per cent in the common lands.[15] The process of fractionization is most advanced in the tiny western communes of Rotondella and Nova Siri. Even the *latifundie* seldom exceed 1,000 acres there. Conversely, Montalbano and Bernalda are primarily *latifundie.* Policoro, the 15,000 acre feudal remnant of Montalbano, is perhaps the largest single unified holding in all the *Mezzogiorno.*

[13] Compiled from data supplied by Prof. M. Rossi-Doria, Portici, communal officials, and the *Consorzio Bonifica,* Matera.

[14] Following the Italian property surveys of 1947.

[15] Estimated from Istituto Nazionale di Economia Agraria, *La Distribuzione della proprieta fondiaria in Italia: Lucania e Calabria* (Roma, 1947), pp. 50–62.

The common lands have been successively divided since Napoleonic days.[16] These small-lot divisions have added to the confusion of the fractionized zone. The present commons have been tentatively divided as a result of the peasant rioting

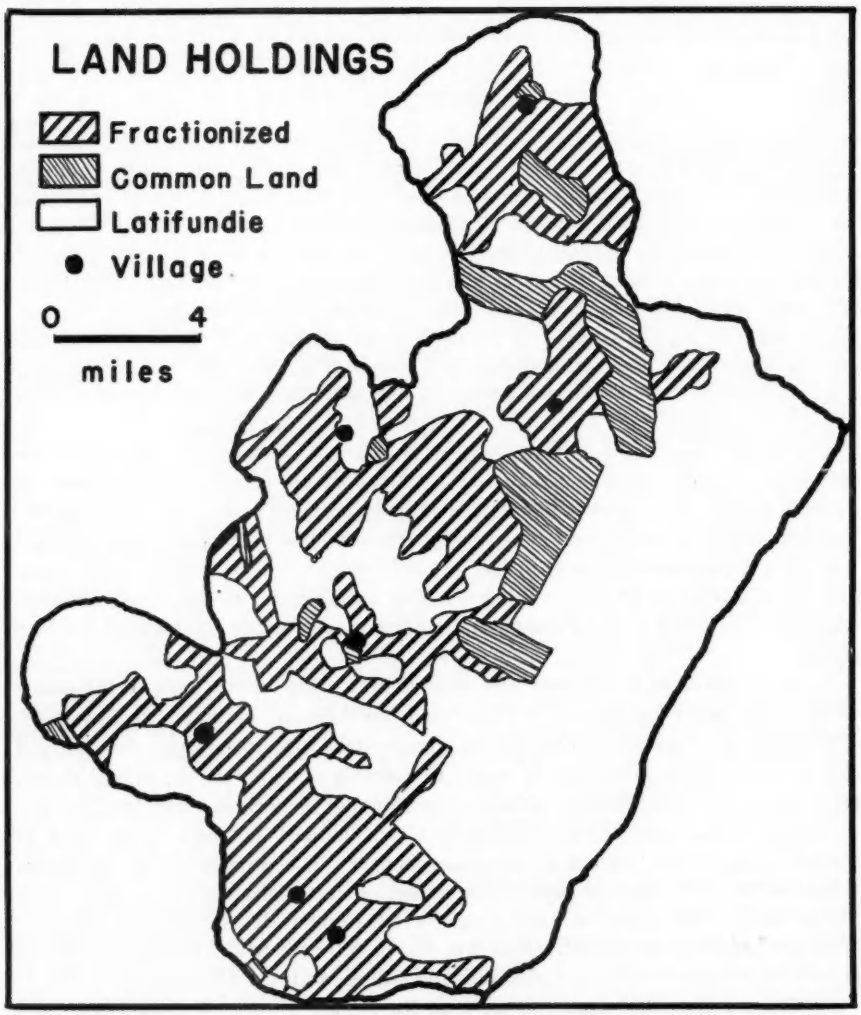


FIG. 5.

of 1947–1949.[17] Such divisions temporarily reduce peasant land hunger. They

[16] Of the commons of 1810, 47 per cent had been divided by 1947. About 70 percent of the present commons are included in the tentative divisions of 1947–1949.

[17] Primarily into very small lots of 3 acres or less.

do not, however, meet the basic problems of land ownership in the fractionized zone. Neither do they solve the ancient conflict between the fractionized zone and the *latifundie*.

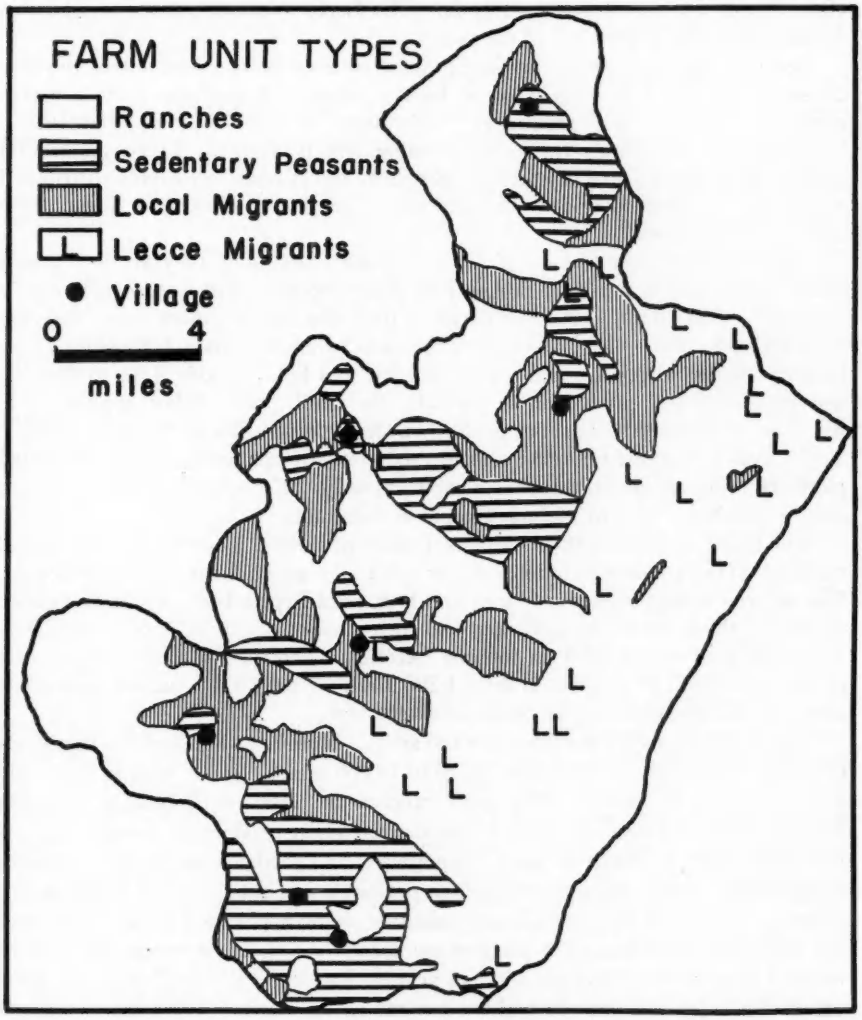


FIG. 6.

Types of Farming Units

Farming units, as distinguished from ownership units, are of four major types: ranches (*masserie*) and three peasant types, sedentary, local migrant, and Lecce

migrant (Fig. 6).[18] Source of labor supply distinguishes ranches from peasant units. Ranches use hired labor almost exclusively; peasant units, a family labor supply. Sedentary peasants live on their units. Local migrants live in the village, often distant from their scattered plots. The Lecce migrants return to Lecce in Apulia during the winter half of the year.

Sedentary peasant units may be 50 acres or even more; most often they are 20 acres or much less. Each has at least a cottage. Sometimes there are also sheds. Tree crops are prominent. Cultivation is often mixed (*promiscua*). Tools are few, but much traditional farming lore is applied. Labor application is high, 30 or more man-days per acre per year, and is relatively evenly distributed seasonally.[19] These units are relatively stable, but they include only about 9 per cent of Metapontino.

Local migrant units may be 25 acres or more; most often they are less than 5 acres. Each unit is normally broken into many separate plots (*spezzoni*), widely scattered. Plots may be 8 miles or more from the village; more often they are within 3 or 4 miles. Grains and beans are most prominent, though tree crops may be grown in the village *corona*. Tools are few and light, notably light steel plows and mattocks. All production is normally for family use. Labor application is less than on sedentary units, but probably at least double that of the ranch units.[19] These units are highly unstable, since owned plots are frequently lost while rented plots are taken on one to three year contracts only. Three-fourths of the peasant area, about 28 per cent of Metapontino, is in such units.

The Lecce migrants rent small plots, usually of about 2.5 acres, from the coastal ranches. They produce only tobacco, for sale to the government tobacco monopoly. The tobacco season begins in March and lasts until September. From September to March, these share-croppers return to their area of origin in Lecce where they sometimes find winter work in tobacco factories. Though less than one per cent of Metapontino is in tobacco, at least 1,200 *Leccessi* make these annual migrations since the labor application for tobacco is very high.

Ranches (*masserie*) dominate the economy. Most have hundreds to thousands of acres. A few giants have from 6,000 to 14,000 acres. Small ranches have only a house and a few barns. The great ranches are vast establishments, veritable hamlets. The ranches specialize in commercial grain production, though there is still some wage payment in kind. Equipment and methods are highly variable; some ranches are no more advanced than peasant units, but many are highly mechanized. Even with only partial mechanization, labor application is low because of the emphasis on grains. On the average coastal ranch, labor application seldom exceeds 10 or 12 man-days per acre per year.[19] One-third of the laborers are hired on renewable annual contracts and are resident on the ranch. The other two-thirds are hired seasonally, especially during the olive and grain harvests. Normally

[18] Field mapping by the author at 1 : 50,000.

[19] Estimated from field data of land use, the official work calendar (*Calendario del Lavoro*, Matera, 1951), and interviews.

these workers reside in local villages, moving only temporarily to the ranches. Ranches occupy about 63 per cent of Metapontino. In addition, most migrant peasants work part-time on the ranches; this work opportunity governs their farming schedules. Thus, although Metapontino's is a mixed ranch-peasant economy, the ranches are overwhelmingly dominant.

Labor Use

Perhaps the most crucial aspect of Metapontino's economy is labor use, i.e., labor need, labor migration, and unemployment. Total annual labor need, i.e., the labor actually needed with existing methods, is about 2,905,000 work days, with 2 per cent for uncultivated lands, 26 per cent for animal care, and 72 per cent for cultivated lands.[20] Sown crops and olives need less than one-third the labor required for vines and less than one-fifth that needed for citrus fruits. However, since over 90 per cent of the cultivated lands are in sown crops and olives, they account for about 70 per cent of the annual labor need for cultivated areas.

Marked seasonal variations in labor need are revealed by graphing the work calendar (Fig. 7).[21] Monthly fluctuations are most violent for the labor-intensive crops such as vines, tobacco, and citrus fruits. However, such variations are not serious if off-set by appropriate combinations of different crops within the same working unit. Some crop combinations are complementary in labor need; others are not. Sown crops and olives complement; sown crops and tobacco conflict. Thus certain crop combinations within working units produce balanced work rhythms while others produce erratic work rhythms and seasonal unemployment.

Each of the four major types of farming units has a distinct grouping of crops; each therefore has a distinct work rhythm (Fig. 8).[22] Lecce migrants raise only tobacco; their work rhythm is most erratic and is accompanied by winter migration to Apulia. Sedentary peasants have the most uniform work year; the wide variety of crops on these units are complementary. However, about 90 per cent of Metapontino is in ranches and local migrant peasant units; both strongly emphasize grain production and both have similarly unbalanced work rhythms. Maximum labor demands occur simultaneously in the two areas; labor demands on migrant holdings conflict with coincident employment opportunities on the ranches.

Work exchanges between ranch and migrant peasant zones occur almost entirely within communes.[23] Communal work rhythms are therefore highly significant

[20] Based on 1952 land use and animal data supplied by the provincial agricultural office and the following estimates of labor need: a) uncultivated lands, 2 work days per hectare; b) horses, mules, and donkeys, 20 work days; cattle, 15; sheep, goats, and swine, 5; and c) cultivated areas, (from the *Calendario del Lavoro*) sown crops, 28 work days; sown crops with tree crops, 29; olives, 28.5; almonds, 35; vines and fruits, 93; citrus fruits, 132; tobacco, 118.

[21] Developed by grouping various categories of the *Calendario del Lavoro,* 1951, Matera.

[22] Calculated by estimating land use figures from the author's land use maps at 1:50,000 for each farming type area and applying these land use figures to the work calendar.

[23] About 14 per cent of Montalbano's agricultural labor supply originates outside the commune; for other communes, net labor immigration is less than 5 per cent of the total (calculated from unpublished data provided by communal labor offices).

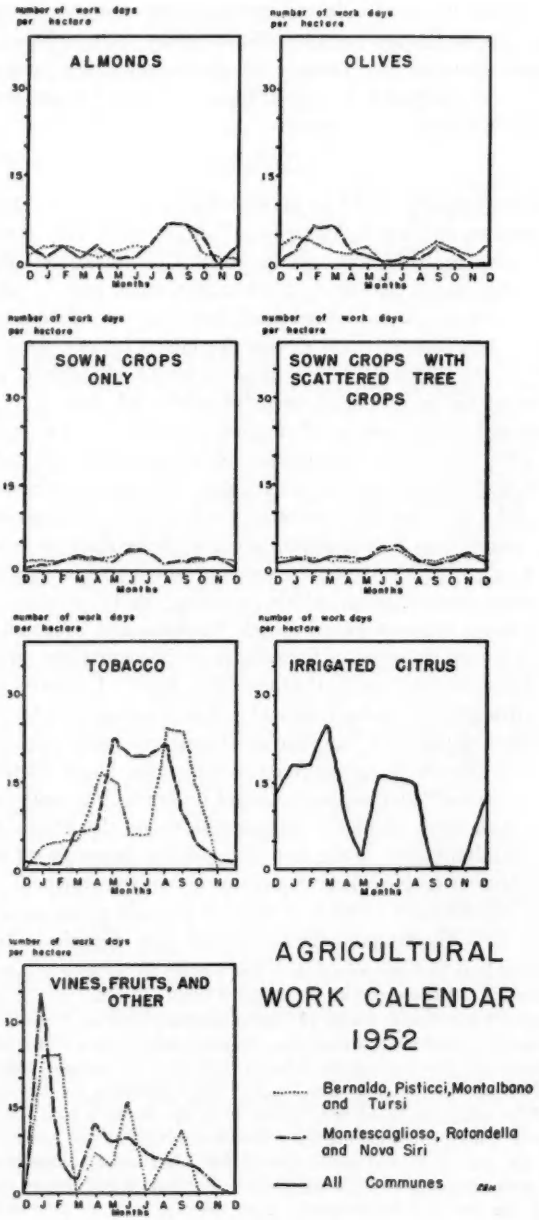

number of work days per hectare
ALMONDS
OLIVES
SOWN CROPS ONLY
SOWN CROPS WITH SCATTERED TREE CROPS
TOBACCO
IRRIGATED CITRUS
VINES, FRUITS, AND OTHER
0
15
30
D J F M A M J J A S O N D
Months
AGRICULTURAL
WORK CALENDAR
1952
Bernalda, Pisticci, Montalbano and Tursi
Montescaglioso, Rotondella and Nova Siri
All Communes

FIG. 7.

Estimated Number of Work Days on Sown and Tree Crops, by the Types of Farming Areas, 1952

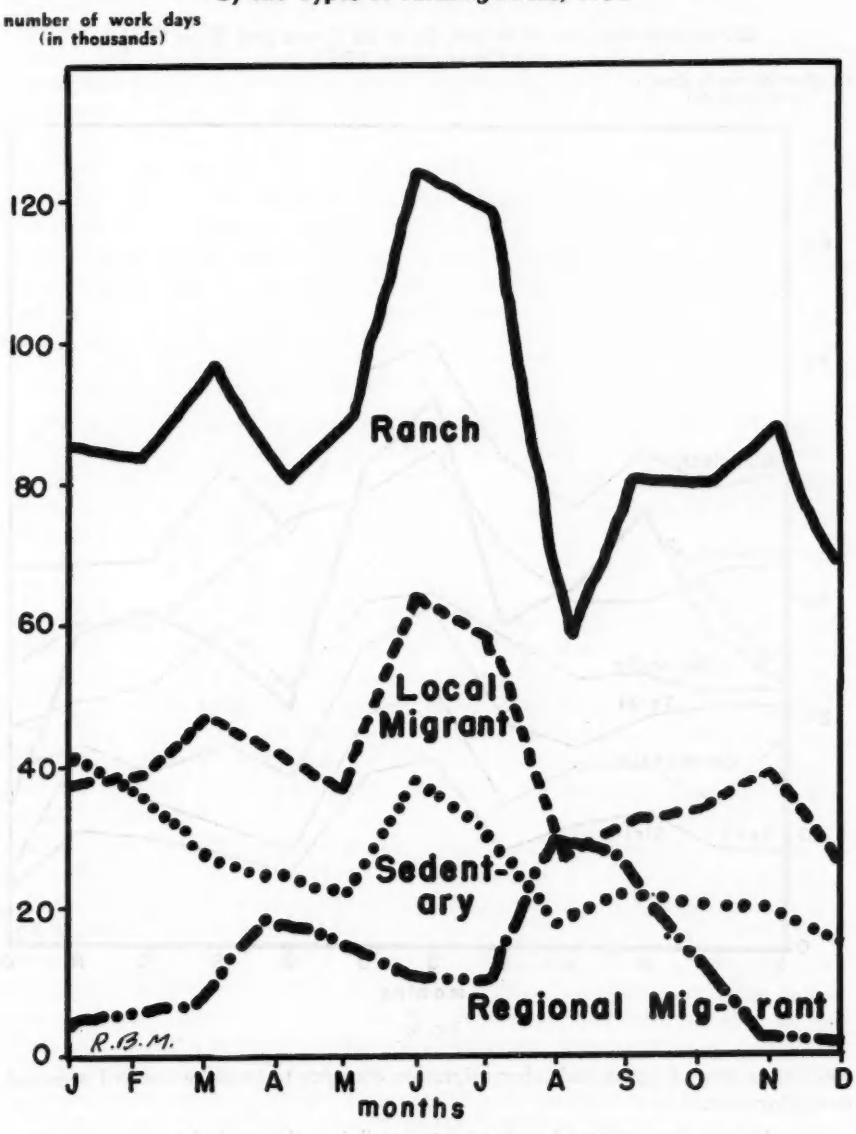


FIG. 8.

(Fig. 9).[24] All have pronounced summer work peaks, corresponding to the grain harvest. Thus, the absolute areal dominance of the grains, farm-unit organization,

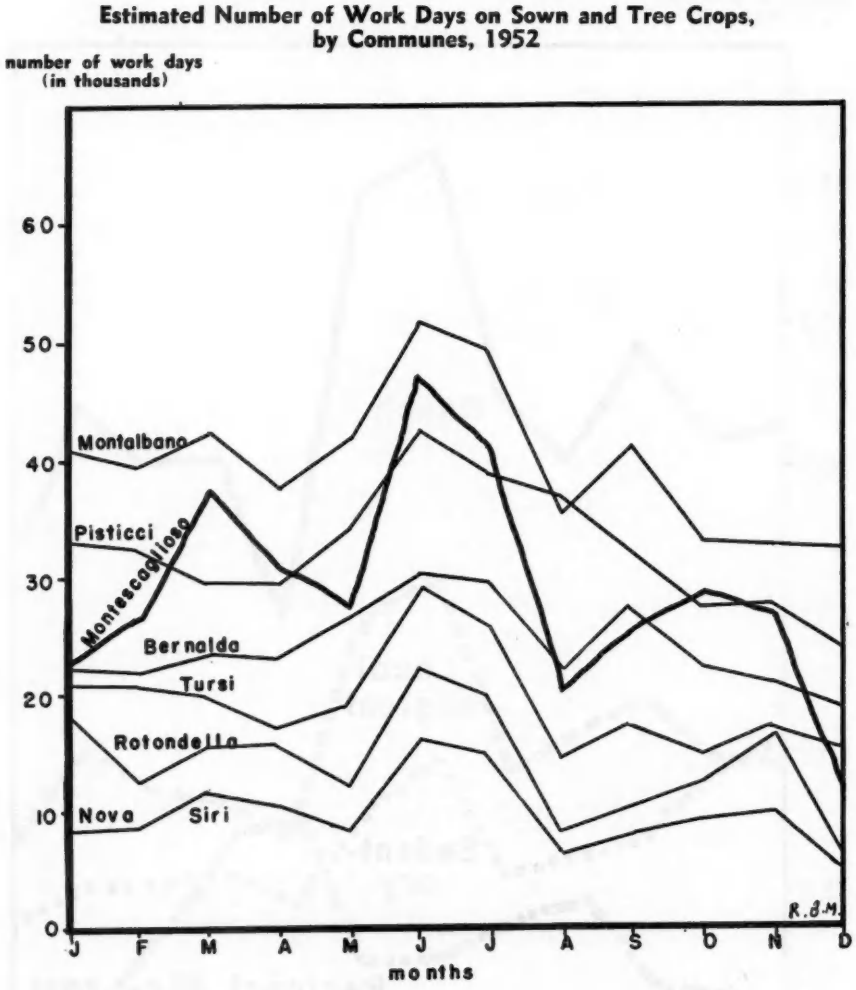


FIG. 9.

and the pattern of communal labor migration conspire to produce marked seasonal unemployment.

[24] Calculated from communal land use data supplied by the provincial agricultural office, Matera.

Agricultural unemployment is endemic as well as seasonal. About 1,600 are unemployed in the harvest months of June and July and over 1,900 in other months.[25] Thus from 10 to 15 per cent of the labor force is permanently unemployed. Yet such figures are deceptively small. Hidden unemployment, or under-employment, is far more significant. Comparison of the estimated total agricultural labor force with the estimated total agricultural labor need indicates a labor excess of over 1,530,000 work days annually, over 35 per cent of the total labor force. Hidden unemployment occurs largely on peasant units, where labor application normally exceeds work calendar estimates of need by three or four times. This amazing labor excess is with present production methods. It does not include the great labor excess which might result from increased mechanization. Unemployment, both seasonal and endemic, is thus a problem of vast and staggering proportions. Solution of this problem, the effective use of this great labor force, is the *sine qua non* for land reclamation and land reform programs.

DEVELOPMENT PROGRAMS

Both land reclamation and land reform, as parts of the overall plan for the South, seek to increase productivity and improve living conditions. However, since the two programs derive from somewhat divergent philosophies of rural development, the methods of achieving these goals are quite different. The areas to be developed under each program overlap, but are not contiguous.

Land Reclamation

Bonifica integrale, comprehensive land reclamation, theoretically aims at the coordinated execution of everything needed to transform an area with its water resources to forms of production which will ensure work and adequate living conditions for all of the rural population. However, land improvement is emphasized rather than changes in land holdings or farming organization. The great land holders have primary responsibility for implementing a reclamation plan, though about three-fourths of the costs for major capital improvements are borne by the national government.

The *Consorzio della Bonifica di Metaponto,*[26] organized in 1925 by 21 great land holders from the coastal zone, has successively enlarged its *comprensorio* (reclamation district) as the need for broad regional planning has become increasingly apparent. Today the *comprensorio* covers 278 square miles, over half of Metapontino (Fig. 10).[27] Parts of Montescaglioso are included in the *comprensorio* of the Middle Bradano which is being developed in association with Metaponto. Though interior fragments of Metapontino are not now included in the reclamation districts, reclamation inevitably influences these communes as wholes.

[25] Official unemployment, as measured by those registering each month minus those finding employment in that month (unpublished data supplied by the provincial labor office).

[26] The *consorzii* are peculiarly Italian reclamation institutions, organized under the national law of 1933 which codified various reclamation laws dating from early times.

[27] Data from the *Consorzio Bonifica,* Matera.

The present program, begun in 1928, has been successively modified. Active reclamation work was accelerated by American aid after the Second World War. Previous work included preliminary road building and drainage. Today Metapon-

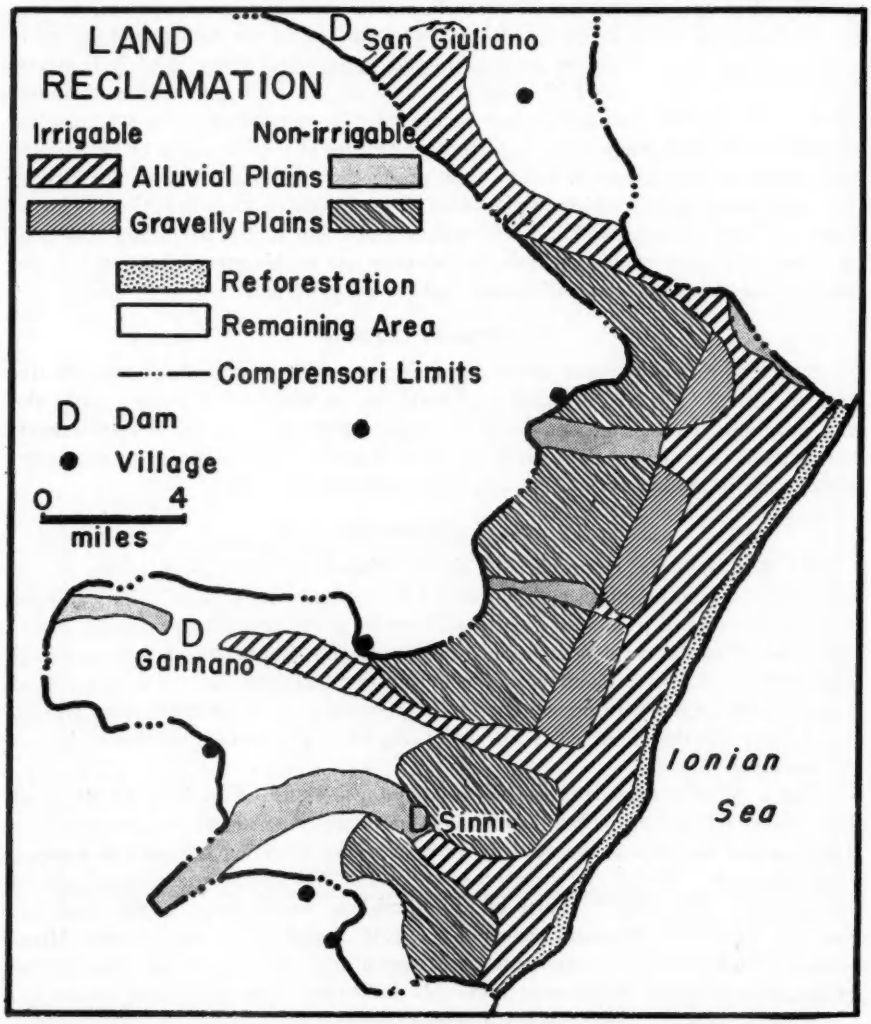


FIG. 10.

tino ranks with the Capitanata as the chief financial commitment of the *Cassa per il Mezzogiorno*. The present plan, dating from 1949, is being modified in accordance with the latest land reform plans.

All of the five rivers have typically Mediterranean regimes, going nearly dry in summer. Only the Cavone is too small to warrant dams to hold winter flood waters for summer use. Such dams will impound the waters of the major streams, the Bradano, Sinni, and Agri. The Basento will not be used at present, primarily be-

TABLE II

CHANGES PROPOSED FOR THE PLANNING AREAS OF THE METAPONTINO RECLAMATION ZONE*

Planning Areas	Major Changes Proposed, 1949	Agricultural Population Supported		
		Before Plan (1949)	After Plan (1969)	Increase Due to the Plan (1949–1969)
Irrigable Alluvial Plain (37,800 a.)	four-fold productivity increase; irrigation with forage, cattle, tree and industrial crops; permanent settlement and decline in labor migration.	4,228	11,970	7,750
Irrigable Gravelly Plain (3,750 a.)	as on Alluvial Plain.	454	1,188	735
Non-Irrigable Gravelly Plain (58,750 a.)	three-fold productivity increase; integration with irrigated zone; diversification with animals, tobacco, vegetables, and tree crops; permanent settlement; decline in labor migration.	6,975	15,510	8,545
Non-Irrigable Alluvial Plain (30,000 a.)	flood and erosion protection; addition of new cultivable land (one thousand acres or more); no specific economic changes proposed.	.....	.....	c.250
Sand Dunes (8,750 a.)	reforestation with pines and eucalyptus to protect irrigable area and possibly provide lumber.	.....	.....	c. 50
Remaining Area of Reclamation Zone (60,450 a.)	slow improvement on an unorganized basis; probable eventual reforestation of large areas, especially the badlands near the villages.	.....	.....	.....
Reclamation Zone				17,330

* Author's estimates, from field data and data supplied by the *Consorzio della Bonifica di Metaponto e Medie Valle del Bradano,* Matera; estimates of population supported derived from the author's land use map and the official work calendar, assuming 250 work days per year per worker and 2.2 persons supported per work unit.

cause of construction difficulties in this clay valley. Additional dams have been proposed for the Sinni and Agri, to provide hydro-electric power and impound additional waters.

Considering only the *Bonifica* program of 1949, the possibilities are spectacular indeed (Fig. 10; Table II). Broad outlines of this program remain unchanged though specific details are being modified as land reform proceeds. The reclamation program concentrates on the alluvial and gravelly plains, leaving less valuable areas to slower development. Some benefits, however, will pertain to the whole zone. The present unstable ranch economy, with its partially employed itinerants, will change to a more stable and diversified irrigation economy, with year-round employment for resident workers. With the expected three- to four-fold increase in productivity, a minimum of 17,000 additional people should be able to live from the area's agriculture. Assuming the present-day service ratio (3:1), about 5,600 others would be supported indirectly. Thus, at today's living standards, the 20-year population increase could be about 22,000 or, if living standards rose substantially, a somewhat smaller number.

Land Reform

Land reform is concerned primarily with the development of the *latifundia.* However, it is much more than a simple program of land redistribution.[28] Although of an emergency nature, it is a comprehensive, organic plan to increase productivity and improve living conditions through changing the relationship of agricultural workers to the land. Since 1950, the reform laws have been applied to those Italian areas which are noted for extensive monocultural grain farming with associated low labor use and low productivity, a predominance of *latifundia,* and endemic unemployment. These areas are primarily in the South. Within the reform areas, rationalized farming units are by definition exempt from expropriation. Metapontino is typical of the areas affected by the reform laws. It is atypical, however, in the great potentiality of the land available for reform development.

Land reform rests upon several premises. It assumes that land reclamation, which focuses on the development of land resources, is not necessarily enough to ensure the full use of both land and labor resources. The relative lethargy of the great proprietors in the past in developing their estates is probably sufficient guide to future intentions. The growth of an independent land-owning peasantry on the *latifundie* is the most practical method of quickly increasing the use of both land and labor resources, providing economic stability, and raising productivity. Only the direct intervention of the government, with its great legal and financial resources, can insure the rapid development of the *latifundie.* Intervention is needed, not only for simple expropriation, but also to aid the peasants for the initial settlement period of 5 to 20 years.

[28] For a detailed discussion of land reform in Southern Italy as a whole, see Robert E. Dickinson, "Land Reform in Southern Italy," *Economic Geography,* XXX (1954), pp. 157–176.

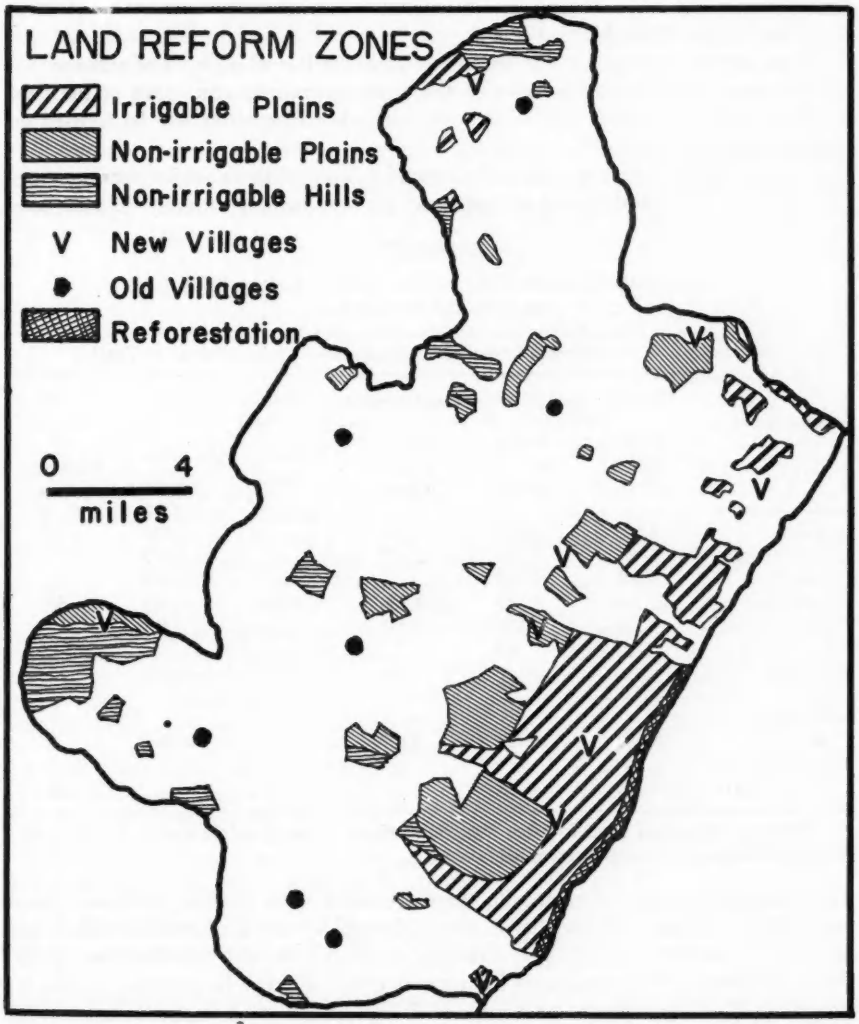


FIG. 11.

The expropriated area in Metapontino[29] is notable for its great size, areal continuity,[30] high agricultural value, and strong concentration in a single commune,

[29] Expropriation is based on taxable value rather than area alone; it is progressive, with the expropriable portion increasing with the total holding. At Metapontino, most holdings of 800–1,000 acres are expropriable in whole or in part.

[30] Many reform holdings are strongly fragmented, making development difficult.

Montalbano (Fig. 11;[31] Table III). Few areas of comparable character exist in all the reform areas of the *Mezzogiorno*.

Plans for the expropriated areas seek to combine the advantages of autonomous family farms[32] with the advantages of the large centralized unit. All of the land will be divided into family farms but some agricultural activities will be focused on central units, the *aziende*.[33]

There will be three types of farms, one for each of three major terrain types (Table IV). Each is designed to support an average family, normally 4.5 members.

TABLE III

TERRAIN CLASSIFICATION OF EXPROPRIATED LANDS, 1952*
(in acres and percentages)

Communes	Terrain Classification (in acres)				Total	
	Irrigable	Non-Irrigable			In Acres	In Percent of Commune Area
	Plains, Alluvial & Grav.	Plains, Alluvial & Grav.	Hills, Clay & Grav.	Sand Dunes		
Bernalda	1,696	3,042	.....	.....	4,738	16
Montescaglioso	1,465	1,223	2,227	.....	4,915	11
Pisticci	4,005	2,670	.....	.....	6,675	12
Montalbano	22,200	7,400	1,500	2,500	33,598	50
Tursi	312	1,750	5,250	.....	7,313	19
Rotondella	112	43	.....	.....	155	2
Nova Siri	353	.....	250	.....	603	12
Metapontino (in acres)	30,143	16,129	9,227	2,500	58,997	..
Metapontino (% of total)	55	28	16	1	.....	22

* Expropriation data from *Riforma Agraria;* irrigation data from *Consorzio Bonifica;* terrain classification by the author from field data.

The size and economy of each will, therefore, vary with terrain potential. Land use changes correspond closely with those planned by the *Consorzio Bonifica,* but are perhaps more certain of rapid execution. Each farm unit will have an appropriate farmstead, with variations for terrain type. Except in portions of the irrigable plain of Montalbano, these farmsteads will be dispersed on the land, a radical departure from previous settlement.

Each *azienda* will serve approximately 5,000 acres. During the initial period these serve as colonization centers. In the long run, they will serve as community

[31] Expropriated areas from *Riforma Agraria,* Matera; terrain classification by author.

[32] Large enough to support a family without outside employment and small enough to require no hired labor.

[33] Similar to the *mezzadria* and *fattoria* system of Umbria.

agricultural centers, with shops, centralized farm equipment, cooperatives, and meeting halls. Primary education, community gatherings, and adult education will be provided. Agricultural extension workers will attempt to directly influence agricultural practice. Local cooperatives will, it is fervently hoped, gradually assume the direction of each *azienda.*

Together, land reclamation and land reform plans include nine service villages, three by the *Consorzio Bonifica* and six by *Riforma Agraria.* Each village will have all the services now provided by the hill-villages with the exception of com-

TABLE IV

MAJOR CHARACTERISTICS OF NEW LAND REFORM FARMING UNITS*

Land Reform Area	Characteristics of New Land Reform Farming Units		
	Mean Size and Economy Planned	Number of Farms	Number of Colonists
Irrigable Land (30,143 acres)	*10 Acres* Tree crops, especially citrus, and vegetables: *2.5 acres;* forage, cotton, sugar beets, and grains: *7.5 acres;* animals, especially stall-fed cattle; farmstead on unit, except in small area of Montalbano.	3,014	13,563
Non-Irrigable Plain (16,129 acres)	*12.5 Acres* Vines, olives, vegetables: *2.5 acres;* sown crops and olives: *5.0 acres;* sown crops: *5.0 acres;* farmstead on unit.	1,129	5,810
Non-Irrigable Hills (9,227 acres)	*17.5–20.0 Acres* Sown crops and olives: *7.5 acres;* sown crops: *10–12.5 acres;* farmstead on unit.	485	2,182
Total Land Reform Area	Land use similar to that planned by *Consorzio Bonifica;* difference in farm unit organization.	4,790	21,555

* Economy planned from *Riforma Agraria,* Matera; terrain classification by the author from field data; estimate of average family size (4.5 members) from *Riforma Agraria.*

munal government offices. Each will attain at least 400 residents; two land reform villages will be both residential and service centers, probably attaining 1,700 to 2,500 people. All nine villages will occupy sites of past ranch centers or railroad station nuclei. All sites now have populations of tens to hundreds and some minor services. Many sites were important centers in ancient or medieval times. The land reform villages will be co-existent with some *aziende.*

A minimum of 21,500 people are needed for the land reform lands (Table IV). This is half as large as the present total agricultural population. Since over half

the farms are in Montalbano, the 13,000 colonists needed there exceeds the present total population. Clearly, some intercommunal migration is necessary. Some migrants will come from densely populated Nova Siri and Rotondella. Colonists from Pisticci and Bernalda will be limited to those formerly seasonally employed in Montalbano. In addition, Montalbano will absorb 4,000 to 5,000 colonists from less fortunate areas in the mountains of Potenza or the limestone plains of Apulia.

Great changes can be expected from this upheaval within the reform zones. Additional changes may follow in the non-expropriated areas of colonist origin. Employment patterns on the ranches may radically change.[34] Reduction of land pressure in peasant areas may allow greater integration of farming units, abandonment of eroded lands, and other land use changes. Unemployment may decline and mechanization increase. Or, conversely, large labor migration from areas of heavy population pressure may minimize these changes.

Assuming full execution of the reform program, there will be a minimum of 21,500 colonists. Since approximately 6,120 people were supported by the reform areas in 1951,[35] the potential population increase would be about 15,430. To this we may add the expected increase from non-expropriated reclamation areas, about 6,230.[36] Thus, under the combined reclamation-reform programs, livelihood possibilities on the land should increase by about 21,660 persons by 1971. Adding the service community in its current ratio (3:1) gives a grand total of about 28,000 people. Rising living standards might of course reduce this potential number.

CONCLUSIONS

Land potentialities at Metapontino are extraordinarily great. While a large agricultural population has been rapidly increasing, development of this great land potential has been retarded. So retarded, indeed, has it been that approximately one-third of the available agricultural labor has been ineffective, with resultant low productivity and abysmal living standards. The problem of retarded development centers in the diverse development of the adjacent ranch and peasant zones. The peasants expend fantastic amounts of labor in their futile attempts to wring their *pane* and *pasta* from the eroded and niggardly hills, while the ranches of the fertile coastal plain have remained virtually undeveloped, frontier-like in character.

Land reclamation and land reform seek to solve this dilemma, each in its own way. Reclamation emphasizes the physical development of the area, especially the irrigation of over 14,000 acres. Reform emphasizes socio-economic changes in the structure of agriculture, primarily through the creation of an independent, cooperative peasantry on former *latifundia* land. Both emphasize the development

[34] To combat unemployment and unrest, the government has required ranchers to employ certain minimum numbers of workers for specific types of production. Reform should reduce the need for this type of governmental labor control.

[35] Using work days estimated from the author's land use map and the work calendar and assuming 2.2 persons supported per work unit of 250 work days.

[36] Revision of Table III to account for overlap of programs.

of the coastal areas. Neither seeks to develop each commune as a unified whole, though the communes are the most important units of socio-economic organization.

Successful execution of the combined programs should, within 20 years, increase productivity by three or four times within the program area. This will allow continued local population increase, a reduction in unemployment and underemployment, a very modest increase in standard of living, and minor immigration from less fortunate zones of the *Mezzogiorno*. For the first time in two millenia, the promise of *Magna Graecia* may be realized.

Accepted February, 1954.

DYNAMIC AND SYNOPTIC CLIMATOLOGY

F. KENNETH HARE
McGill University

INTRODUCTION

DISCUSSION of world and regional climates in terms of the atmospheric circulation is by no means new. Most of the climatologists of the early years of this century made a conscientious attempt to enliven their accounts with descriptions of typical weather conditions, types of flow and the like. Static considerations still, however, outweighed the dynamic in the thinking of the ordinary worker in the field. The solar rhythm dominated the tropical climates, for example, and the thunderstorms (which provided *all* the rain) came dutifully along during the late afternoon. The disturbing fact that for considerable periods they failed to come altogether, or came instead at night, was often regarded as a statistical aberration. That such aberrations might have their origin in dynamical factors, automatically squelched by the averaging process, was overlooked. There were notable and honorable exceptions, of course, among whom we ought to number Robert DeCourcy Ward, charter member of this Association. As long ago as 1905 he preached the same cause as this present paper espouses.[1]

The older climatology, based on tables and maps of mean values, unenlivened by a knowledge of day to day weather changes, was regarded by both geographer and meteorologist with suspicion and open dislike. "Climatology," wrote Jacobs, "as defined by the civilian meteorologist, has been quite generally held in contempt by the forecaster. . . . The forecaster absorbed into meteorology all those portions of climatology which he found useful, and reserved the name *climatology* for those portions of the science that presented weather information in a form unsuitable for his purposes."[2]

This attitude, which is still alive, is serious in its effects, for forecasters tend to dominate the senior echelons of the world's meteorological services. All too often the climatological divisions of those services are starved of staff and equipment: until quite recently, in at least one country only the old, the halt, and the infirm could be appointed to the climatological branch; the able-bodied men were expected to be forecasters, which was man's work.

This paper discusses some of the methods whereby the climatological record is being put into a shape more valuable to the meteorologist and the regional geographer; the topics will be dynamic and synoptic climatology, closely related and rapidly developing fields. The views presented are highly tentative, and do not represent final or even very well considered views. They are put forward in the hope of starting arguments among the writer's geographical colleagues.

[1] R. DeC. Ward, "Suggestions Concerning a More Rational Treatment of Climatology," paper presented to the 8th International Geographical Congress, Washington, D. C., 1905.

[2] W. C. Jacobs, "Wartime Developments in Applied Climatology," *Meteorological Monographs*, I, No. 1 (August 1947), p. 33.

DYNAMIC CLIMATOLOGY

Of the group of Scandinavian meteorologists who revolutionized synoptic analysis some thirty to forty years ago, Tor Bergeron is one of the most significant. He is well known for his work on airmass analysis[3] and on the physics of precipitation,[4] but his climatological work has attracted less attention. In 1929, however, after the Norwegian ideas of frontal and airmass analysis had enjoyed ten years of active use, he read a paper in Dresden in which he proposed that these analytical ideas should be applied to the study of world climates. For this field he proposed the term "dynamic climatology," by analogy with dynamic meteorology.[5]

His paper advocates the identification of flow-patterns "more or less closed in the dynamic-thermodynamic sense" (like the monsoons of the east, or the trade winds) that represent distinctive combinations of weather with a definable circulation. In the temperate latitudes, where there is a wide range of possible flow-patterns, ". . . semi-stationary weather types . . . *must be isolated analytically* which can then be studied as well-defined unequivocal total processes, analogously to those of monsoons. . . ." (The translation is Conrad's, but the italics are mine.) He goes on to say (and again I use Conrad's translation): ". . . the new synoptic concepts of air masses and fronts are necessary and, in most cases, sufficient components to be inserted into the general circulation, and . . . they thus form the basis for a general dynamic climatology."[6]

Bergeron's maps make his intention clear. They are based on Köppen's well-known maps of surface-wind distribution. To the wind-streamlines, Bergeron has added (i) labels showing the dominant airmasses, (ii) the average or standing position of equatorial, polar, and arctic fronts. The maps are confined, unfortunately, to North America and the Pacific, but it is clear that he meant his generalizations to be world-wide.

This work of Bergeron's is obviously the parent of the host of similar studies of world airmass circulation in the German, British, and American literature. The idea of airmass climatology was widely used in the next fifteen years.[7] In the past two years general treatments of regional or world climates along the lines suggested have appeared in the geographical literature of Britain, Switzerland, and

[3] Tor Bergeron, "Über die dreidimensional verknupfende Wetteranalyse," *Geofysiske Publicationer*, V, No. 6 (1928); also many other papers. The most widely accepted system of airmass classification traces back to Bergeron.

[4] Tor Bergeron, "On the Physics of Clouds and Precipitation," *Procès-Verbaux, Météorologie, Union géodésique et géophysique internationale* (Lisbon, 1935), pt. 2, pp. 156–178.

[5] Tor Bergeron, "Richtlinien einer dynamischen Klimatologie," *Meteorologische Zeitschrift*, 47, heft 7 (1930), pp. 246–262.

[6] Tor Bergeron, *op. cit.*, pp. 246–247. Conrad's translation is in V. Conrad and L. W. Pollak, *Methods in Climatology* (2nd ed.; Boston, 1950), p. 316.

[7] For example, see H. Landsberg, "Air Mass Climatology for Central Pennsylvania," *Gerlands Beiträge zur Geophysik*, 51 (1937), pp. 278–285; E. Dinies, "*Luftkörper-Klimatologie*," *Aus dem Archiv der deutschen Seewarte*, 50, No. 6 (1932).

the U. S., by Miller, Brunnschweiler and Borchert, respectively.[8,9,10] Miller includes world maps showing dominant airmasses, principal orographic features and rain-belts; his flow-lines seem to be sketched. He also includes tables of world climatic regions showing how each is affected by specific airmasses and fronts. Borchert's analysis is more ambitious. He has drawn complete world streamline maps for both seasons (using prevailing winds). He shows areas of divergence as well as dominant airmasses. Most significant of all, he locates (on his figure 5) climatic regions, defined in terms of dominant airmasses and separated by boundaries that he claims are inherent in the circulation itself. This paper seems to the author to be the logical conclusion to the procedure Bergeron recommended but never completed.

SYNOPTIC CLIMATOLOGY

War-time needs between 1939 and 1945 strongly re-emphasized the weakness of the older, single-point statistical climatology, with its static "explanations." The military services of the belligerents wanted to know how weather elements *combined* over large areas: the air forces, for example, were interested in combinations of visibility, cloud-base, and wind-direction. To get this correlated information out of the historical data by ordinary statistical methods was hopelessly slow, and often impossible. The answer was provided by the introduction of synoptic ideas. The characteristic flow patterns, airmasses, and frontal frequencies of the operational areas were determined and were used as the basis upon which to marshal the weather data. Similar methods were used in all the larger countries involved.

The United States' answer has been described by Woodrow C. Jacobs,[11] who termed his methods *synoptic* (or *synchronous*) *climatology.*[12] Very closely parallel techniques were developed separately in Great Britain and Germany. Jacobs' procedure is carefully programmed (to permit of machine methods) and is claimed to be completely objective. Having selected his area so that it is small enough for the flow across it to be represented by a single wind vector (his independent variable), he then determines isobar curvature (as an indicator of relative vor-

[8] A. Austin Miller, "Air Mass Climatology," *Geography,* vol. 38 (1953), pp. 55–67.

[9] D. H. Brunnschweiler, "The Geographic Distribution of Air Masses in North America," *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zurich,* Jahrgang 97 (1952), pp. 42–49.

[10] J. R. Borchert, "Regional Differences in the World Atmospheric Circulation," *Annals of the Association of American Geographers,* XLIII, No. 1 (March 1953), pp. 14–26.

[11] W. C. Jacobs, *op. cit.,* pp. 38–43. See also "Synoptic Climatology," *Bulletin of the American Meteorological Society, 27,* No. 6 (1946), pp. 306–311.

[12] The same term was used for the same purpose in Great Britain. It was first suggested to the writer in 1942, by C. S. Durst, Chief of the Investigations Branch of the British Meteorological Office, and he used it in his own military reports (see for example *Aviation Meteorological Report on Northern Italy,* Meteorological Office Miscellaneous Publication 365/18, 1943). For a review of this field from the British viewpoint, see C. S. Durst, "Climate—the Synthesis of Weather," *Compendium of Meteorology,* American Meteorological Society, 1951, pp. 967–975.

ticity), airmass type, and vertical structure. The ordinary weather data are then sorted mechanically and presented as frequency tables with respect to flow-type, speed of flow, character of flow, and airmass type. One of his figures shows how this method clarifies the winter climate of Hokkaido, and how emphatically it improves on the mean map.[13] The daily synoptic chart is used, incidentally, in long historical series to determine the airflow pattern and gradient wind-speed.

The close relationship between dynamic and synoptic climatology is obvious. The former is broader in scale, being in effect a regional or global synthesis of daily circulation types. Synoptic climatology, on the other hand, deals specifically with regions small enough for the recognized circulation types to be interpreted in terms of the ordinary weather elements. The former was conceived intellectually as a method of illumining the study of world climates: the latter came into being as an empirical method of meeting operational needs. Nevertheless, both rest on the same fundamental principle, that the circulation of the atmosphere must be made the basis of such forms of climatological analysis.

THE PROBLEMS OF A QUANTITATIVE TREATMENT

The weakness of descriptive dynamic climatology as recently practiced is its subjectivity and the qualitative nature of its methods. All branches of climatology ought surely to put themselves within the reach of statistical proof, even if that "proof" does not exceed the level of certainty represented by a contingency table. As it is, however, the identification of flow-patterns is usually made by "an inspection of a long series of historical weather charts" by a competent analyst. This is a sound procedure for synoptic climatology when the area is kept small enough for the gradient wind vector to be regarded as a sufficient determinant. But the larger requirements of dynamic climatology can only be met if one can "type" synoptic charts objectively, a problem familiar to the meteorologist as "analogue" determination.

Most attempts at synthesis over large regions or the earth itself are based on *mean* charts of circulation, on the basis either of pressure distribution (giving resultant geostrophic winds) or of prevailing winds. Both methods are of limited validity:

(1) The mean pressure map is usually regarded as giving vector mean geostrophic flow at any point at which the ordinary geostrophic determination is made. But within the 30° parallels, the geostrophic approximation to the real wind above the friction layer becomes progressively less valid as the equator is approached (because of the decrease of the Coriolis parameter). Moreover James has recently shown that over short periods considerable vector differences may occur even in higher latitudes between the true vector mean and computed vector mean flow.[14]

[13] *Op. cit.*, fig. 20.

[14] R. W. James, "Physical Significance of Mean Flow Charts," *Meteorological Magazine*, 81, No. 956 (1952), pp. 42–48.

The distribution of period-mean sea-level pressure has for long been the classical foundation of studies of the general circulation and of world climates. But the business of dynamic climatology is to dissociate the resultant flows into meaningful *component* circulation types. Accordingly the mean pressure map is a poor weapon except as a starting-gun, for it generalizes too soon.

(2) Streamline analysis of prevailing winds, as practiced by Köppen (whose maps Bergeron adopted) and Borchert, gets over the difficulty of the decrease of the Coriolis parameter as the equator is approached, but gets into difficulties of its own. If the streamlines are merely drawn parallel to the most frequent wind *direction* in the wind roses, they are of very limited physical meaning. If they are drawn through *resultant* winds for each station, they are markedly improved, though they are not, in the technical sense, then streamlines at all. In the first case, the result is usually a map of circulation for which there is no conceivable corresponding pressure distribution. One can imagine no pressure distribution corresponding to the flow depicted over northeast Siberia, for example, on Borchert's map of July prevailing winds.[15] It is true (and this is another limitation of such maps) that they are drawn for surface winds, rather than for the free flow above the ground-friction zone. The fact remains, however, that most "streamline" maps of middle and high latitudes represent abstractions that could never exist as actual synoptic cases.

The direct analysis of regional or world mean or prevailing flow patterns is thus fraught with difficulties.

The adoption of the airmass as a standard analytical tool also seems open to criticism. At its best, the identification of airmasses on the synoptic chart is an approximate, subjective business. Airstreams, characteristic patterns of flow bringing air with specific recent trajectories, are obvious on any map. But it must be remembered that the shear of wind with height is usually so great that the column of air above the observer at any one moment is torn asunder at the next. There is no semblance of three-dimensional integrity about most of the airmasses identified on the surface chart. Thus published averages of upper air temperatures for specific airmasses, like those recently assembled by Belasco for the British Isles,[16] are to be interpreted as thermal stratifications typical of the British Isles *when the surface airstream is of the type concerned*, and not as specifications of the properties of quasi-rigid masses of air. Burbidge, when analyzing the modification of continental polar air over Hudson Bay,[17] found few instances of quasi-rigid flow; in most cases the

[15] *Op. cit.*, fig. 4.

[16] J. E. Belasco, "Characteristics of Air Masses over the British Isles," *Geophysical Memoirs*, Air Ministry, London, No. 87, 1952.

[17] F. E. Burbidge, *The Modification of Continental Air over Hudson Bay and Eastern Canada*, thesis submitted for M.Sc. degree, McGill University, 1949, p. 139. See also *Quarterly Journal of the Royal Meteorological Society*, 77 (1951), pp. 365–374.

trajectories of the air at the surface—850 millibars, 700 millibars, and 500 millibars—differed widely. The shear of wind of height, moreover, often involved differences of direction as well as speed.

These facts are, of course, commonplace to every synoptic meteorologist: Belasco, Petterssen, Willett and others who have published normal lapse rates for standard airmasses were perfectly well aware of this limitation. The difficulty is mentioned here to illustrate the dangers of relying too uncritically on airmass frequencies and average properties in climatological work.

ALTERNATIVE METHODS

It has been suggested above that the interpretation of mean pressure or circulation maps, though a valuable first step, might well be improved upon. It is now time to examine methods that permit the more direct interpretation of synoptic chart series, for the analytical isolation of flow patterns, Bergeron's recipe for dynamic climatology, is possible only on the daily map.

Point or areal frequency maps have their advantages. In their preparation, the analyst examines a long series of synoptic charts; he tabulates for a grid of sampling points (e.g., 5° lat.-long. intersections) or for areal blocs (like 5° squares) the frequencies of certain elements such as sign of vorticity, frontal passages, specific airmasses, cyclone and anticyclone centers, and so on. These frequencies, when assembled on a map, and analyzed by isopleths or frequency diagrams, very strikingly illustrate the integrated characteristics of the circulation over the area, and go a long way towards meeting the declared objectives. A few examples will be discussed below.

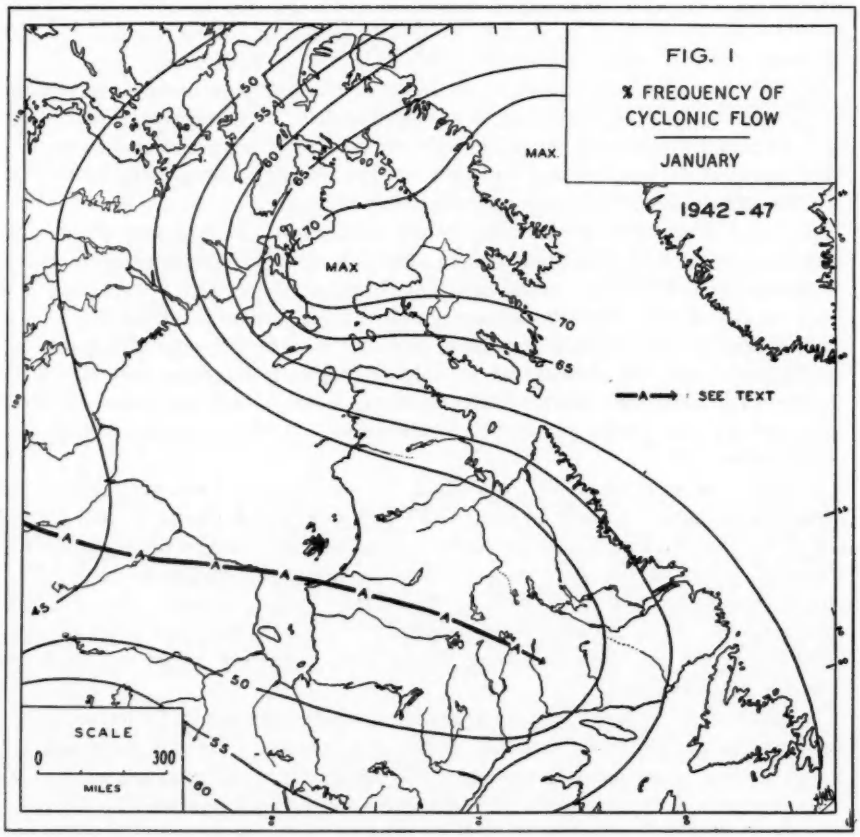
Figure 1 is an example of the method. It shows the percentage frequency of occasions in January (based on 0030 GMT and 1230 GMT charts) between 1942 and 1947 when cyclonic isobar curvature existed over the eastern Canadian Arctic. Figure 2, based on the same series, shows the percentage frequency with which fronts were located within 150 miles of the sampling point. Finally, Figure 3, this time for July, shows the percentage frequency of Atlantic maritime polar air over the same area. All the maps were drawn from frequency tables prepared for 5-degree intercept points.

Similar methods have been employed on a vastly larger scale by Petterssen in his treatment of the general circulation of the atmosphere.[18] He has computed for 5-degree squares (corrected to squares of 100,000 square kilometers) the frequencies of cyclogenesis, anticyclogenesis, cyclone-centers and anticyclone-centers. The technique has also been applied by Namias, to show by 10-degree squares the frequency of troughs and ridges on the 700 millibar charts over North America.[19] There are many other examples.

[18] S. Petterssen, "Some Aspects of the General Circulation of the Atmosphere," *Centenary Proceedings of the Royal Meteorological Society*, 1950, pp. 120–155, especially figs. 14–23.

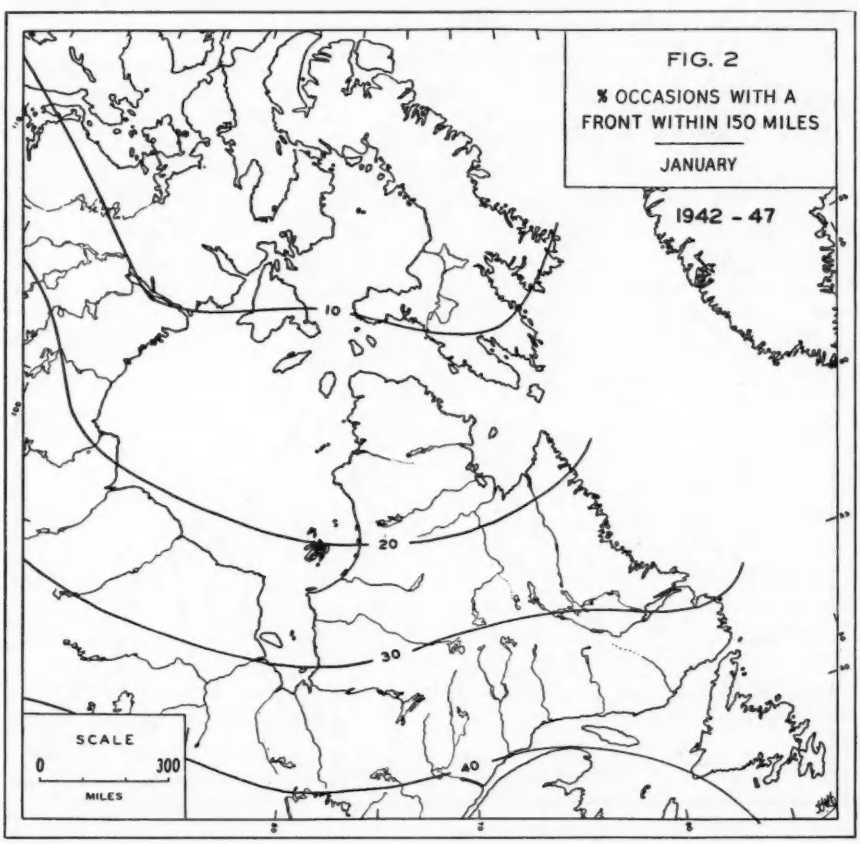
[19] J. Namias, "Thirty-Day Forecasting: A Review of a Ten Year Experiment," *Meteorological Monographs*, II, No. 6 (July 1953), fig. 35.

Such a sampling of the daily circulation patterns, given a sound choice of parameters, goes a long way towards providing the statistical summarization demanded by Bergeron, and the data obtained, when plotted on maps, illustrate something of the daily reality behind the abstraction of the mean circulation or pressure maps. Moreover, such methods lead naturally into synoptic climatology and can thus provide a valuable link between the general objectives of the dynamic field with the highly specific purposes of the synoptic.



All maps of this type naturally incorporate all the errors of the original analysis. Mr. Andrew Thompson once told the writer that the conspicuous storm path across southern Canada (shown on most older maps of cyclone paths) follows the main line of the Canadian Pacific Railroad, for long the northernmost line of telegraphic reporting stations! It is vitally important to use historical chart series that have been drawn by competent analysts with a shrewd eye for continuity, and without preconceptions about such things as the alleged anticyclone over the Artic Ocean.

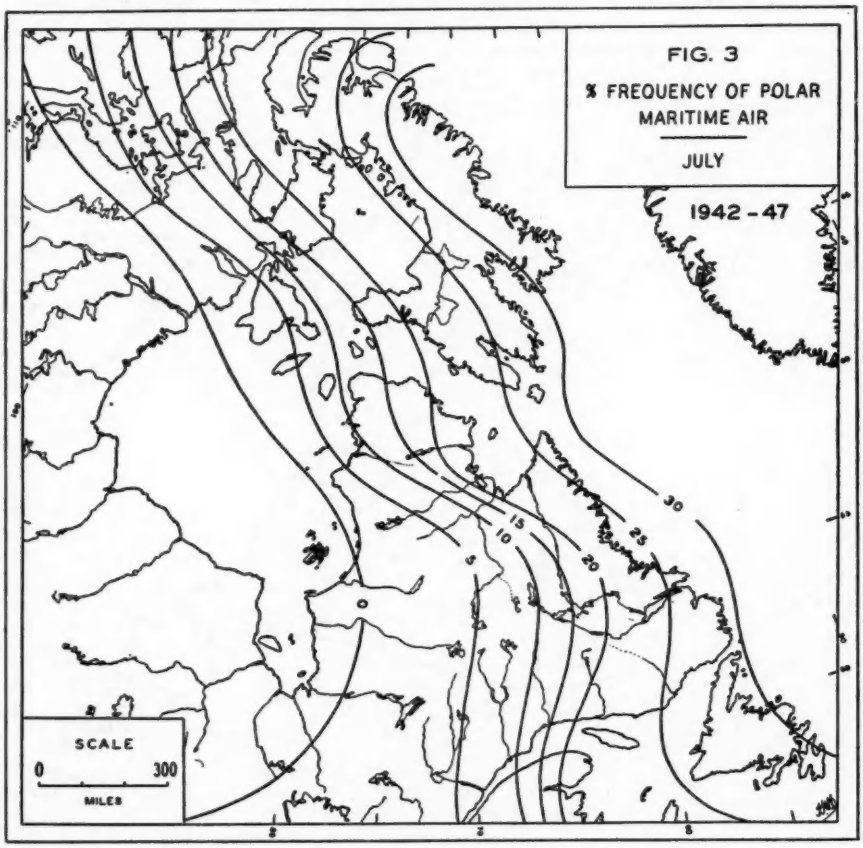
Statistical specification of the pressure pattern offers another and perhaps the most far-reaching tool. The obvious parallel between Bergeron's "analytical isolation" of flow-patterns and the "analogue" method introduced into forecasting by I. P. Krick has already been mentioned. In its simplest form, the analogue method involves separating synoptic patterns into groups, all members of the individual group being regarded as nearly identical analogues. The assumption is then made—



often incorrectly—that all the members of the group will develop similarly. On the whole, analogue forecasting has fallen on hard times, but some of its methods are of permanent value.

Of these, by far the most important are those concerned with the specification of the pressure field over large areas in simple, numerical terms. Hitherto, we have had to accept the synoptic chart as a picture too complex to yield to simple description. Anyone who has tried to "type" charts outside certain favored areas knows how dubious a process it is. In order to render the chart series accessible to quan-

titative classification, and to make the whole chart serve the purposes of real statistical analysis, one has to "specify" it, that is, to find some set of mathematical expressions that reduce the complexities of the pressure distribution to a set of numerical parameters. Though many attacks have been made on this formidable problem, the methods described by Wadsworth seem most pregnant.[20] By using a system of



orthogonal polynomials, he has succeeded in reducing the pressure distribution over an area of 35° latitude by 65° longitude to fourteen parameters, which account on the average for about 80% of the daily variance of pressure. Tables of the values of these parameters are available for about forty years.

That this method provides a veritable treasure-trove to the dynamic climatologist

[20] G. P. Wadsworth (with J. G. Bryan and C. H. Gordon, collaborators), *Short Range and Extended Forecasting by Statistical Methods,* Air Weather Service Technical Report 105–37, February 1948, pp. 128–158.

is obvious. It offers, for the first time, a quantitative measure of the circulation over a large region. It is true that indices of the circulation have been available for a long time—the zonal index, for example—but they have been indices, not specifications. Wadsworth's system is already being made the basis of an assault on the dynamic climatology of North America by T. F. Malone and a group of collaborators at M.I.T.[21] Malone's approach differs in many ways from that of earlier workers in this field. He makes no attempt to isolate flow patterns, preferring to regard the circulation over the whole area as a variable with which to correlate the behavior of the ordinary weather elements at fixed points. It is quite clear that this approach resembles neither the precedent of Bergeron nor the synoptic method of the military climatologists.

It is worthy of comment that much of the work of the extended forecast groups, and of the research being conducted into the general circulation, is climatological in scope, involving as it does the determination of frequencies, means, and probabilities. The climatological nature of this work is rarely admitted; it becomes "statistical meteorology" or something akin to it. One might quote Sir John Harington:

> Treason doth never prosper—What's the reason?
> If it doth prosper, none dare call it treason.

Substitute "climatology" for "treason," and the point is made. In any case, call it what one will, the work of these groups is of enormous importance to the dynamic climatologist.

CONCLUSION

It is thus clear that dynamic climatology—and synoptic climatology, too, though in less measure—can be practiced effectively only by those who have a very comprehensive grasp of modern methods of synoptic analysis, as well as a respect for statistics. Its results, however, ought to be comprehensible to a much wider public. Climatology is not an occult science, nor does it have a prescriptive right to the support of workers in other scientific fields. It has got to be intelligible, to be useful to a wide professional circle, if it is to attract the support we think it deserves. But its methods, like those of all other sciences, have to be adapted to the problems it studies, and cannot be varied to please the prejudices and capabilities of an external public.

This uncompromising conclusion raises the question so far carefully avoided in this study—what use can the geographer make of such a climatology? The value to the meteorologist of the dynamic and synoptic approaches is beyond question, for they improve his forecasts, answer his operational questions, and provide him with a clear-cut generalization of the regional atmospheric circulation. But do such contributions matter to the geographer, with his pre-occupation with the areal differentiation of the earth's surface and his prime concern for the needs of

[21] T. F. Malone, D. G. Friedman, and R. G. Miller, "A New Approach to the Problem of a Synoptic Climatology," paper presented to the American Meteorological Society, New York, January 26th, 1954. To be published.

human society? Does it not seem more logical that he should prefer a climatology like that of Köppen or Warren Thornthwaite, who directed themselves less to the behavior of the atmosphere than to its interaction with the earth's surface and its living cover? Or, again, might he not do better to devote his attention to the directly anthropocentric approach of the physiological climatologists like Douglas Lee?

This article was not written to answer these questions, which will be debated elsewhere. Instead, the writer will point to this fact—that most regional geographies, whether text-books or research monographs, do in fact adopt the dynamic method in part. The writers of such studies seem to feel the need to specify the typical weather-types, storm-tracks, airmasses, and the like. They feel—and they think their readers feel—a discontent for a purely descriptive account of the standard climatic elements.

The writer suggests that if such an account of the atmospheric circulation over a region is considered a necessary part of its written regional geography, then this account must be written with all the rigor and all the sophistication of a full-scale dynamic climatology. Here, as in all other aspects of physical geography, there is no half-way house other than that of mediocrity.

ABSTRACTS OF PAPERS PRESENTED AT THE 51ST ANNUAL MEETING OF THE ASSOCIATION OF AMERICAN GEOGRAPHERS, MEMPHIS, TENNESSEE, APRIL 11–14, 1955

EVAN B. ALDERFER—*Regional Geograhy in Central Banking*

The Federal Reserve System consists of a Board of Governors in Washington and twelve District Banks throughout the country. No two districts are alike in surface, climate, peoples, industries, and products. Nor does any region stay put geographically; it is subject to ceaseless change. Therefore, each bank should know its local geography.

Each bank, as well as the Board, has a research staff. Thus research is rooted in regionalism. This set-up affords channels for concentric flow of economic intelligence to the country's monetary headquarters responsible for the maintenance of sound money and credit policies.

At the Philadelphia Federal Reserve Bank, swivel-chair research is supplemented by geographic exploration. The quest for firsthand information has taken us into the stockyard and tobacco fields in Lancaster, into brooder houses of the Delaware broiler peninsula, into the coal mines of the "black diamond" country, into the apple orchards of South Mountain, cement quarries along the Lehigh, mushroom houses along the Brandywine, and oyster beds in Delaware Bay.

WILLIAM APPLEBAUM—*What Are Geographers Doing in Business?*

At the AAG meeting in 1946 the author presented a paper "The Geographer in Business and His Requisite Training," outlining his views on what the geographer can do for business by ascertaining *where* goods and services can be sold at a profit. These endeavors were designated as Marketing Geography. A fuller treatment of Marketing Geography was presented in *American Geography: Inventory & Prospect,* 1954.

Regarding the geographer's training for employment in business the author suggested in 1946 that the university teachers of geography maintain contact with businessmen and with their colleagues in the school of business administration; that the students, in addition to geography, study also economics, marketing and market research, and statistics and accounting, and that they get firsthand experience in business through employment during vacations in the sales or marketing research department.

Since 1946 the geographer's interest in business and the businessman's interest in geography have progressed to their mutual benefit, but more slowly than need be. At the AAG meeting in 1954 six papers were presented on the work of geographers in business; this is a historic bench mark. The summary of the group sessions on applied geography validates the continuing usefulness of the views presented by the author.

There is a danger that geographers are over-emphasizing the application of geography in business and are ignoring theoretical considerations. Without a distillation of concepts and principles, the geographer may confine himself in business to the chores of a hewer of wood and drawer of water. Also, there is a need of clarifying what is business. Business is concerned with *all* economic activities plus consumption. Geographers are urged again to market their services to business under the title Marketing Geography.

The time is here for a full-scale survey, sponsored by AAG, to inventory American geographers' experience in business. The inventory should include work done and for whom; new concepts, methods, and principles developed; areas of professional strength and weakness encountered; work satisfaction and remuneration; further interest, etc. Geographers who have done no work for business should indicate their interest in such work.

The results of the survey would serve as a basis for further organized action to expedite the qualifications and opportunities of geographers for work in professionally interesting, socially useful, and well-paying jobs in business.

We must look, think, plan, and act for the long range, with a little dreaming and considerable self-confidence.

JOHN P. AUGELLI—*A West Indian Anomaly, the British Virgin Islands*

Circulation of people, goods, and ideas between politically separated islands is rare in the West Indies. Parallel economic development and similarity of products have sharply limited local commerce. This, together with poor transport facilities, tariff controls and other political barriers have traditionally oriented the Indies more to outside areas than to each other. For the colonial islands, trade is determined largely by political affiliations; the closest economic integration is developed with the governing power and, occasionally, with other dependencies under the same flag. For independent units, such as Cuba, the Dominican Republic, and Haiti, the chief ties are the middle latitude markets, particularly the United States. A traveller in the area often finds that it is less difficult to book passage to Miami, New York, or Mexico City than to obtain similar services to a nearby island. He further finds that the local press in the West Indies is notoriously weak on "regional" news, and that the man in the street seems to have greater interest in and knowledge of events taking place abroad than in other islands in the Caribbean.

The British Virgin Islands represent an exception to this pattern of orientation. Politically the islands constitute one of the four presidencies in Britain's Leeward Islands Colony. They are, however, the most remote of these units, and for most purposes have established stronger socio-economic ties with the American Virgin Islands and the United States than with either Britain or other British possessions and dominions. St. Thomas in the American Virgins not only represents the principal export market and the chief source of imports, but it also offers more opportunity for wage employment to B.V.I. labor than can be found at home. Currently, the economy of the presidency is so closely linked with that of its American neigh-

bors that it functions exclusively on the basis of American currency. The British islanders will accept only U. S. money for goods and services, and even the British government officials are forced to calculate the budget in terms of the American dollar.

Viewed against the regional background of the West Indies, the integration which the British Virgin Islands have achieved with their American neighbor poses an interesting economic and political anomaly. What are the factors which led to this unique integration in a region where ties among politically separated islands are rare? How has the integration affected the land and people complex in the British islands? What problems stem from the political separation of the integrated areas and what possible solutions may be proposed? Finally, are there any conclusions which may be drawn from this case study regarding the problems and probabilities of integration elsewhere in the West Indies?

HARRY P. BAILEY—*Approximate Seasonal Terms to Correct Precipitation Effectiveness Computed from Annual Temperature and Rainfall Data*

Much of the year's precipitation in a given area may be concentrated in months warmer or cooler than the mean annual temperature. Precipitation effectiveness based upon annual data alone therefore differs considerably from results obtained by a summation of monthly indices. To reduce that difference, two proposals are offered.

The first defines only differences in the seasonal concentration of precipitation. Denoted by the symbol R, the percentage of the mean annual precipitation occurring in the winter half-year, this variable when introduced into Köppen's equations for the dry climates affords reasonable and continuous boundaries.

The second proposal takes into account seasonal differences in temperature as well as those of precipitation and treats temperature exponentially: $EP = P/k^{T \pm x}$, where EP is the mean annual precipitation effectiveness in inches, P is the mean annual precipitation in inches, T the mean annual temperature in degrees Fahrenheit, k a constant having the tentative value of 1.025, and x a correction in degrees Fahrenheit to T.

The solution of x is taken from a nomogram having as its arguments R and the mean annual range of temperature. For most mid-latitude stations, *i.e.*, stations where the annual march of temperature is regular, effective precipitation so computed is in close agreement with the sum of monthly amounts of precipitation effectiveness. This is a fact of importance in estimating precipitation effectiveness where terrain is so complex that the preparation of monthly data is unduly costly in time.

ALBERT G. BALLERT—*The Nature of Geographers—and the Business World*

Geographers on frequent occasions have indicated that their realm of operation extends beyond the ivy-covered walls and governmental halls. It is the purpose of

this paper to explore somewhat into the nature of geographers—their interests and activities—in order to suggest means of achieving their claims.

Three terms used by the automotive industry in evaluating sales operations—potential, performance, and penetration—are appropriate in appraising the situation. The *potential* of geography for a wider field of operation appears good, but greater *performance* in these areas by geographers is needed. This is essential if geography and geographers are to obtain *penetration* in our last professional frontier—and possibly our greatest—the business world.

JAMES A. BARNES—*The Selection of Isopleths for Maps in Series*

One of the problems in statistical mapping is that of making possible the comparison of maps in series. This problem is particularly complex in the case of isopleth maps, either those representing the same distribution at different times, or those representing distributions that differ in kind. The difficulty results from the fact that the values represented by the isopleths are relative, and a direct comparison of such values may be valueless, extremely difficult to make, or even impossible.

Although isopleths as such do not represent absolute value, each isopleth because of its nature becomes a closed line and, in conjunction with its neighboring isopleths, defines specific areas. The areas so delimited represent actual values, not only in the area they occupy, but in the sense that the relative values used in mapping are based on actual values that occur within area. Thus isopleths can be selected so that they will delimit areas of given size, population, production, or any other absolute value which can be measured within area.

Development of an absolute-value scale for selecting isopleths gives a new meaning not only to the isopleths and the areas they delimit, but to the resulting map as well. Maintenance of the same absolute-value scale in a series of maps provides isopleths, and hence maps, that can be compared in a simple and objective manner.

THOMAS FRANK BARTON—*Twenty-five Years' Use of the Nine-Foot Ohio River Channel*

After a stormy debate as to the need and feasibility of providing a minimum 9-foot navigation channel in the Ohio throughout the year by means of movable dams and dredging, such a river improvement project was authorized in 1910 and construction was completed in 1929. Now after the canalized waterway has been used for 25 years, it seems appropriate to (1) evaluate the original need for its construction, (2) assess the contribution of navigation to the Ohio watershed and the country, and (3) appraise the plans for future improvement.

Apparently the strongest proponents of canalization underestimated and did not predict the growth of commerce which took place. When it was authorized, the project was justified economically on the basis of an estimated traffic of 15 million tons. After 25 years the river was carrying over 60 million tons.

During the past 15 years industrial growth in the Ohio valley and watershed

has been substantial, due partly to cheap transportation of coal, such raw materials as petroleum, and such manufactured products as iron, steel, and cars. Within a 250-mile radius of Cincinnati lies about 70 per cent of the Atomic Energy Commission's planned development east of the Mississippi. Government-owned plants represent an investment of between four and five billion dollars. As a traffic artery, the Ohio no longer is limited to serving our steel mills, but now serves oil refineries, chemical plants, and many other types of factories. Since the second World War more than 2,500 factories have located here.

Money has now been authorized for the construction of higher and permanent dams which will provide greater opportunities for the multiple use of the water.

J. EDWIN BECHT—*The Chemical Industry and the Midwestern Rivers and Intracoastal Canal*

Chemicals are the fastest growing segment of the U. S. economy. Chemical processors more than doubled their plant capacity between 1939 and 1949 and since then have added from $1.5 to $2.0 billion annually to that capacity. More than one-half of all new petro-chemical plants and about one-third of other post-World War II chemical construction are concentrated along the Midwestern Rivers and Intracoastal Canal. Accounting for this concentration are: 1) raw materials and markets; 2) extensive plant sites; and 3) low-cost, in-bulk transportation.

First, petroleum, natural gas, brines, and sulphur lead among the many chemical raw materials accessible to vast and growing markets in the Gulf Coast, Upper Valleys, and Great Lakes areas. Second, the fact that "the chemical industry is its own best customer" requires extensive sites to accommodate several sprawling plants in a cluster—each plant performing a step in a given process. Such locations are available along these waterways. Third, the chemical industry has resorted to vertical integration to meet a competitive situation that first began to develop in 1948. Therefore, to maintain the lowest possible processing costs the industry is depending more and more on water transportation. Especially is this true of intra-corporation movements. In turn, barge carriers responded by developing special equipment to move acids and other chemicals in mass to meet the demands of endless belt and pipeline techniques used in modern chemical processing. Combined, these factors account for the highly successful concentrations of chemical plants along the Midwestern Rivers and Intracoastal Canal and indicate a capacity for further development.

LYDA BELTHUIS—*The Snowy Mountains Project in Australia; An Introduction*

In the Southeastern Highlands of Australia rises the Snowy River which flows unchecked to the sea, as well as other streams which are now not fully utilized. The Snowy project, started in 1949, is a plan to tap these streams to provide two million acre-feet of badly needed irrigation water for the western slope streams, the Murrumbidgee and Murray, and in addition to obtain three million kilowatts

of hydroelectric power, an amount which exceeds that of the present generating capacity of Australia.

The project is being developed in two parts. One includes the joining of several streams by tunnels to supply water to the Murray River; in the other, similar structures will give even larger additions to the Murrumbidgee. Each part includes several hydroelectric stations.

One phase of this work was completed before the end of 1954. This included the Guthega Dam on the Snowy River, a tunnel carrying the water, and the Munyang station which provides 60,000 kw. of power.

While the whole is a long-term project, various parts will be finished in few-year intervals so that by 1961–62, 660,000 acre-feet of water and 140,000 kw. of power are to be made available to Southeastern Australia and increasingly larger amounts in two decades when the project will be completed.

J. M. BLAUT—*A Functional Study of Chinese Vegetable Cultivation in the Lower Kallang Plain of Singapore*

This paper describes an experiment in the application of functional theory and microgeographic method to a concrete problem in agricultural geography. The aim of the described project was to establish a research base for planned development of Singapore Island's specialized leafy-vegetable farms. Comprehensive and detailed data concerning productive processes were sought on 224 farms in the one important agricultural area of this type. The functional approach, which concentrates on localized spatio-temporal processes rather than areal differentiation or long-term development, was adopted as the study's theoretical framework. Microgeographic methods were employed to obtain adequate intensity and detail.

The paper discusses the substantive results, theory and field methods, and aims of the project, and considers the degree to which theory and methodology contributed to attaining the goal sought. Factors and processes are examined in detail, and conclusions as to policy are drawn. A final section discusses functional theory, its general outlines as applied to geography and its significance for this study.

Noteworthy features of the farming area include an average yield of 59 tons per acre, rural population density equivalent to 7,927 people per square mile, and average size of farm of 0.6 acre. These conditions reflect extraordinarily intensive agricultural resource-use processes, largely traceable to Kwangtung culture and the commercial influence of the city of Singapore, and associated with a high degree of control over crop ecology and the derived micro-environment. Factors in these processes include heavy fertilization, frequent hand-watering, and careful crop management practices.

ALFRED W. BOOTH—*The Cairo Corridor*

The Cairo Corridor is that trafficway zone which extends from north of the junction of the Mississippi and Ohio Rivers at Cairo, Illinois, southward to Memphis, Tennessee. On the west it is bounded by the Ozark Plateau and on the east by the Interior Low Plateaus.

The role of this corridor in the transportation geography of United States has been continually changing. Until the 1850's the Mississippi River was the corridor's sole inter-regional traffic route. With the coming of the railroads and the Civil War, when most of the river's former north-south traffic was diverted into a west-east direction, the corridor went through its period of least significance. Construction of north-south rail lines after the Civil War returned some traffic to the corridor, but it was not until the present century, and especially during the past 35 years, that it regained national importance. River traffic has multiplied more than twenty-fold. Five major interstate oil and natural gas pipelines and four through motor truck routes have been established. Furthermore, traffic has continued to develop on the five major rail lines passing through the corridor. Over 40,000,000 tons annually or more than 10% of the United States' north-south traffic is estimated to pass through the corridor today. In contrast to the situation a century ago, more tonnage now moves north and south.

Chicago and New Orleans are probably the greatest single controlling points for traffic through the Cairo Corridor, but there is a heavy flow of northeast-southwest traffic, and a lighter northeast-southeast flow.

DONALD D. BRAND—*Geography and Journalism*

The modern journalist has become almost more important than the school teacher as a dispenser of information and moulder of public opinion, especially since his field now includes not only newspaper and magazine articles and advertising copy but radio and television scripts as well. It has become increasingly important therefore that the journalist, in the words of such well-known schools as Northwestern and Illinois, "know something about everything," or, more particularly, that he not be the purveyor of a great deal of misinformation.

Since the majority of American journalists are now products of schools and departments of journalism, the latter are striving to broaden their curricula in view of the tremendous responsibility that now devolves upon them. These curricula include such worthwhile subjects as economics, political science, history, sociology, and psychology. Yet nowhere is a course in geography required or even strongly recommended by an accredited school of journalism except at Georgia and Oklahoma, and there are (1954) thirty-nine members of the Association of Accredited Schools and Departments of Journalism. Thirty-two of these universities and colleges have departments of geography with major programs; and in thirty institutions one or more geography courses may be elected towards satisfying the college or university degree requirements.

This virtual ignoring of geography continues despite the fact that some of the most egregious errors being made daily (by even such a well-known journalist as Drew Pearson) lie in the field of geography. Such an attitude toward geography does not obtain among the journalists where German or French influences obtain, as in Latin America, for instance.

Isn't it possible that the fault lies with American geographers themselves, who have done so little to convince the academic world that geography has grown up,

that it is no longer the simple-minded grammar school stuff that even many deans of colleges still believe it to be. Perhaps it is time for geography to reassess itself to see whether it is actually living up to its full potentialities, and then to begin selling itself to journalists and others who might very well profit by a better knowledge of geography.

DAVID BROWN AND VICTOR ROTERUS—*River Basin Planning—Geographical Opportunities*

This paper discusses the role of the geographer in river basin planning. It deals with (1) the scope and functions of river basin planning; (2) the needs of river basin planning in terms of specific professional background, training, and techniques; (3) the tools and skills which the geographer can draw upon to contribute effectively to this field; and (4) the extent to which geographers are participating in river basin planning.

Comprehensive river basin planning of today is an activity of many facets. It involves soil, climate, minerals, water, forests, industry, power and energy, recreation, manpower, navigation, irrigation, agriculture. It also involves federal, state and local government actions, and the action of private industry and private citizens as well. In concept and action, it requires the engineer, the economist, the statistician, the planner, the geologist, the finance expert, and a host of other professional and technical skills and know-how.

As a result, one of the major aspects of river basin planning is the problem of marshalling this variety of technical information and personal know-how into a coordinate, integrated plan of development for the river basins as a whole. Harnessing all of these elements together, and focusing them directly on the task of planning and implementing, such an integrated and coordinated river basin program requires, above all, an ability to visualize the many different elements as they relate to one another, and the patterns of their areal distributions.

The geographer, with his concern with the regional concept—the interrelationships and significance of individual elements within areas and their association to elements in other areas—can render valuable staff assistance to administrators charged with the responsibility of carrying out river basin development plans, particularly where there may be conflicts between different interests, alternative uses of land and water resources, and scope, scale and timing of specific projects. He can also be of service to federal-state interagency committees which have been created for the purpose of developing integrated water and land resources programs within our large river basin areas. These services may involve such special tasks as identification of economic and functional patterns within the various basins; developing techniques in assessing benefits and costs of specific projects; and determination of future basin-wide needs.

The notable contributions already made in the field of river basin planning by such geographers as Harlan H. Barrows, Charles C. Colby, G. Donald Hudson, Edward Ackerman, Gilbert White, and others demonstrate the effectiveness of the geographical approach to river basin planning. Yet despite the excellent

groundwork laid by these men, the apparent need for the basic skills and tools of the geographer in river basin development, and the increasing emphasis being placed on river basin planning as a means of achieving the coordinated development of the land and water resources of this country, relatively few geographers today are active participants in this field. There apparently is a need for geographers to give more attention to this important field, from the standpoint of both academic training and professional career participation.

WILLIAM R. BRUECKHEIMER—*Economic Fundamentalism in Economic Geography*

The thesis of this paper is that geographers have often seriously erred in drawing their conclusion from economic-geographic studies, and that these errors can be traced to fallacies of unstated or concealed premises, missing quantities, omitted factors, and to fallacies about human behavior.

Geographers have consistently failed to state the premises and assumptions upon which their work has been based. These concealed premises have more often than not been those of classical economics, which have been found seriously wanting by many economists in studying industrial society let alone those areas of different cultures and different economic orientation. Not only have studies been based on concealed and often false premises, they have also ignored many (omitted) factors that are subject to mapping and interpretation—factors which might lead to different conclusions than those reached. Geographers are also given to stating many ambiguous conclusions with reference to the production of commodities. For example, it is often stated that a certain product requires cheap labor. What is meant by cheap labor? How low or how high is cheap? If a jute worker's wages were doubled, would he still be classed as cheap labor, and what effect if any would his doubled wages have on the competitive position of jute?

The remainder of the paper proposes a change in emphasis in our approach to economic geography and suggests a number of studies which would enable us to better meet our social responsibilities as world citizens as well as geographers.

HENRY J. BRUMAN—*Recent Agricultural Colonization in Brazil*

Brazil is one of the world's largest underpopulated countries and contains extensive tracts of land suitable for colonization under the present degree of advancement of human technology. An active immigration program is under way, which in 1954 approached the rate of 50,000 immigrants a year. The newcomers are going (a) to the cities, (b) to suburban "green belts" economically tributary to specific urban centers, and (c) to planned colonies in the pioneer fringe which have at least minimum advantages for the production and marketing of certain agricultural products.

The present paper is devoted mainly to an analysis of the settlement processes included under (b) and (c), above. It is based on field work carried on in 1951 and 1952 under the auspices of the Geography Branch of the Office of Naval Research.

A number of examples of successful and unsuccessful agricultural colonization are presented, and the factors involved in success or failure are analyzed. Dot

maps have been prepared showing the growth and spread of population in south-central Brazil between 1940 and 1950. Other maps show the westward and northward advance of the pioneer fringe and the location of the most active recent centers of settlement. Some general conclusions are presented regarding Brazil's present immigration and colonization policies, and an appraisal is given of the extent and broad significance of Brazil's absorptive capacity for new colonists in the next few decades.

DIETER H. BRUNNSCHWEILER—*Toward a Classification of Climates on an Aerosomatic Basis*

The present availability of weather data over the Northern Hemisphere and the vastly increased knowledge of atmospheric phenomena make it possible now to define climate as the result of the frequency and efficiency of individual air masses affecting a particular area. An air mass is a meteorological complex, but also a climatic factor. It is measurable areally and temporally definable. It can therefore be climatologically conceived, having its share in the climate of a region for the time of its prevalence, i.e., it contributes its weather characteristics to the area it influences and by which it is itself influenced. The author uses the name "aerosome" in order to differentiate it from an air mass in a strictly meteorological sense.

A set of Historical Weather Maps of the Northern Hemisphere over a five-year period was used to determine the daily distribution of aerosomes, recognizing the geographic quality of aerosomes on one side, adhering to the above given definition on the other. One hundred and eighty stations were selected. For each the daily air mass type was recorded, together with temperature, precipitation, and wind data. Maps were prepared to show the areal extent of the individual aerosomes in different seasons. Superposition of these maps revealed frequency distributions which are shown in diagrammatic form for typical stations. These models are called somograms by the author.

Aerosomatic regions representative of typical prevalence and succession of aerosomes were then delimited. Source regions (the term "monosomatic" areas is suggested) have at least 80% prevalence of a particular aerosome. Such areas are surrounded by others in which two or more aerosomes determine the climate ("polysomatic" areas). The regions thus established were compared with climatic regions delimited by other classifications. Some boundaries are closely coincident, while others do not concur. In many cases they seem to represent the dynamic character of the climate better than the static "average" boundaries.

The author believes that further aerosomatic studies on a worldwide basis should bring us nearer to the often postulated genetic classification of climates.

JOHN E. BRUSH—*The Functional Classification and Spatial Pattern of Urban Settlements in Northeastern New Jersey*

The functional analysis of 134 urban places in the Northeastern New Jersey Metropolitan Region requires a system of classification which takes account of the relative concentration of trade and services and/or manufacturing in each place.

The ratio between local employment in either of these two major types of economic activity and the total resident working population is the basis of classification. Under the criteria used, any urban place may be classed as *either*, or *both*, a commercial and manufactural center. If the ratios of employment in both these economic activities in any place are below certain limits, it is considered a residential settlement. Accordingly, 38 places are classed commercial and 67 manufactural, of which 25 are also commercial; 54 places are residential.

The spatial analysis of these three classes of urban settlements shows contrasting patterns of location. Manufactural centers are crowded adjacent to one another in three main areas, attractive by reason of rail and water transportation or water power. Commercial centers are dispersed throughout the Metropolitan Region generally at five- to ten-mile intervals. They are always located at points served by rail or water transport facilities, but their development is evidently influenced by the service requirements of people residing in surrounding non-commercial areas, in contrast to manufacturing development which displays strong agglomerative tendencies. Residential settlements are spread chiefly in two sectors of the Region at distances of 15 miles from the major manufactural areas of northeastern New Jersey and within 25 miles of Manhattan.

MEREDITH F. BURRILL—*Stream Terms in U. S. Geographic Names*

The author's catalog and distribution maps of generic terms in the names of physical features in the United States show more than 160 terms used for flowing streams or the linear depressions in which they flow, or both. Although there is no kind of watercourse to which the same term is invariably applied, in many small regions and in a few larger ones there is a high degree of uniformity. Also, though no term is applied only to a single kind of watercourse and to no other kind of feature, some terms designate only one kind of watercourse in a small region.

Variation in terms is greater for short tributaries than for large streams. The use of valley terms to connote both watercourse and the flowing water is relatively uncommon for perennial streams, common for intermittent ones, and usual for ephemeral ones; it is also more frequent for small tributaries than for large watercourses.

There are areas of apparent non-occurrence of each of the terms, and, conversely, widely scattered occurrences of some terms that recur frequently only in concentrated areas.

ALBERT S. CARLSON—*Express Highways—A New Plant Location Factor*

"Express Highways—A New Plant Location Factor" is the title of this paper. A century ago my subject would have been entitled "The Railroad—A New Plant Location Factor." Railroads were already 21 years old. There were enough rail lines by 1851 so that people knew what they were like and what they could do. Their influence on the location of factories was already being felt. This is the way it is with express highways and their industrial potential in 1955.

The express highway is a really new facility for transportation, geared to rapid,

high-volume movements of both people and freight between cities, or from one part of an urban area to another, and, possibly, between regions. Many are under construction and in operation but their impact on relocation of industry is only beginning to be felt.

The significance of the express highway as a new plant location factor may be better realized when we learn that expressway speeds bring a factory 7 miles from a railroad team track as close in time as a downtown factory one mile from its team track. Or, it may take 10 minutes to truck materials from an intown plant to a freeway entrance half a mile from the truck dock, 5 miles along the freeway to an exit, and another half mile to the supplier's dock. But, an outlying plant not next to an expressway would take nearly 20 minutes to go the same six miles. The time-saving in starting a truck cargo on its journey for a long haul is just as substantial; and the more of a trip a truck performs by expressway rather than ordinary street, the lower is its operating cost per mile and the less is its risk of accident and delay.

The gain from a location along or close to an expressway entrance becomes greater when accessibility to labor force is considered. If a worker is willing, as most of them are, to travel 30 minutes to work, an intown plant can reach out by streetcar or bus only 5 miles for workers, figuring a 5-minute walk at each end of the trip. An outlying plant, not near an expressway, can easily reach about 10 miles (figuring a 5-minute walk from the parking lot). *But,* a plant 2 minutes from a freeway, with the same 5-minute walk, can attract workers from 15 to 20 miles away, depending on how far they live from an access point at the other end.

We can expect industries to choose many sites along or within easy access of entrance points to express highways in the immediate future because the expressway restores to a plant site all of those advantages of accessibility to suppliers, related industries, markets, and labor that a similar plant used to enjoy on intown sites before congestion set in. At the same time, the expressway location makes possible the occupation of a large site of many acres at relatively low cost, the construction of the increasingly popular one-story factory, room for parking and gardens, room for expansion, and the amenity of space for landscaping and advertising. These advantages are shared by other outlying plant locations but not to the same degree.

Industries will be quick to seek out and locate on or near express highways in preference to other locations. Decentralization of industry along expressways and related highways and away from urban agglomeration is rapidly moving from the realm of theory into actuality. The process opens up new jobs and fields of study for geographers.

ALBERT S. CHAPMAN—*The Economic Regions of Turkey as Characterized by Railway Shipments*

The regional structure of Turkey has been described in several ways, yet none of these have purported to be an areal analysis of all major types of economic production. An illuminating approach to a study of Turkish economic regions is pos-

sible through an analysis of railway shipments, since the railroad lines of Turkey extend into every major region within the country. In addition, it is estimated that this system was responsible for at least three-fifths of the internal freight transportation in 1948.

Compilation of railway shipments by region of origin reveals that the coastal fringe of Turkey is comparatively more productive than the interior. The five coastal regions, which include about half the people but only one-third the area of Turkey, account for 61 per cent of the railway freight. Three of these coastal regions are particularly important. The Western Pontic Region stands out as the coal-mining and steel-making section; the Marmara Region as a metropolitan area, originating a large proportion of manufactures; and the Aegean Region as a prolific realm of specialized agriculture and lignite mining.

The interior, including central, eastern, and southeastern Anatolia, emerges as the granary and pasture land of Turkey and the source of most of its metalliferous mineral deposits.

The principal disadvantage of this method of regional analysis probably lies in its underevaluation of those few sections of the country which are primarily dependent upon coastwise shipping. However, as a whole, the analysis yields the most reliable presentation of the distribution of commercial production within Turkey.

JOHN WESLEY COULTER—*Human Geography of Guam: A Reconnaissance Survey*

The people of Guam, a tropical island of 225 square miles isolated in the Pacific, were organized into a Territory of the United States in 1950. Their problems relate to the fact that they live on an island where peasant agriculture is the main means of livelihood, and that, emerging from social isolation, they are attempting to establish a democratic form of government.

They owe their culture in part to rule by Spain for 200 years, an epoch reflected in their ethnic affinities, their language, customs, religion, and, in the landscape, by the remains of forts, chapels, and other structures built during the Spanish regime.

The great majority of the Guamanians live near the coast in the southern half of the island. The northern half is a bastion of defense of the United States. Corn, the main food crop, is planted in the less-wet season of the year, rice at the beginning of the wetter season. Other crops have no regular planting time for, when the coastal lowlands are wet, peppers, squash, taro, and other vegetables are planted on the higher, drier inland. Only a little fishing is carried on. Air Force and Navy personnel, their wives and families, furnish a market for the surplus produce raised.

The Guamanians have a unicameral legislature which enacts the laws of the island, provided they are signed by the governor. The fiesta of the old Spanish days is still, in each village, the great social and religious event of the year.

The future of farming depends on controlling insect pests and on raising more and better crops by the use of fertilizer. Social and political progress will develop with experience.

RAYMOND E. CRIST—*Some Competitive Aspects of the Florida Citrus Industry*

A brief historical resumé of the citrus industry is given, followed by a discussion of its agronomic aspects. During the years 1918–1948 the fruit industry of the Middle West, the East, and the Northeast declined markedly, while the citrus industry prospered, due largely to the enormous sums of money spent on research and experimentation, to technological improvements, and to an extensive advertising campaign. These divers factors are considered and their influences weighed in the analysis of the present situation.

RAYMOND E. CRIST—*Some Notes on Recent Trends in Rice Production in Cuba*

There is a brief summary of the history of rice growing and rice consumption in Cuba in which various reasons are brought forward for the preference of Cubans for rice over other cereals. Then the changes wrought by World War II are discussed. Rice growing is expanding on savanna soils; hence does not compete for space with sugar cane, the great commercial crop of the island. Soils that only a few years ago were considered poor to worthless are being used for the production of rice, on a large-scale, mechanized basis. The rapidly evolving cultural landscape in the rice-producing sectors is due almost entirely to the favorable economic climate induced by the high price of rice.

RAYMOND E. CRIST—*Along the Llanos-Andes Border in Venezuela—Then and Now*

A discussion of some of the principal physical and historical factors which have been operative in the creation of the present day cultural landscape in this area in which I worked during the years 1928 to 1931—(cf. "Along the Llanos-Andes Border in Zamora, Venezuela," *The Geographical Review,* Vol. XXII, No. 3 [July, 1932], pp. 411–422). By revisiting the area in 1954 I was able to get historical perspective on changes in transportation, farming, public health, and so on, in the area, and analyze the reasons for such changes.

FLOYD F. CUNNINGHAM—*The Oil Industry of Egypt*

The oil-producing fields of Egypt lie on both sides of the Gulf of Suez. Commercial production first began in the Gemsa field in 1910. In the seventeen years of its existence it yielded a total of only 193,000 tons of oil. In 1913 the Hurghada field about 30 miles south of Gemsa was opened up, searchers for oil having been directed to the regions by the anticlinal structure of the limestone surface. For a long time the field supplied Egypt's total requirements. Today only 24 of the original 143 wells produce daily about 100 tons of oil and 800 tons of water.

Only after the development of modern geophysical methods was the Ras Gharib field, about 40 miles to the north of the Gemsa field, opened up. Today the 136 wells constitute the largest producing field of Egypt. Oil is produced from five different levels. The peak of production was reached in 1947 and this field is now also on the decline.

More recently the small producing fields of Ras Sudl and Asl have been opened up on the eastern shore of the Gulf of Suez.

The location of the fields in a rather remote dry desert area create many problems in production, transportation, refining, and marketing. Food and other supplies must be brought in from the Nile Valley over rather difficult routes of travel. After gas and water have been removed, the oil is shipped by tankers to Suez where the total production is refined. Only at Hurghada is the water deep enough to permit tankers to load from a pier; at Ras Gharib tankers must be loaded by using a submarine oil-line. Ras Gharib is located in an area where no fresh water is available; tankers which carry the oil to Suez bring back each day an average of 1500 tons of fresh water to meet the needs of the community of some 5000 people that has grown up around the wells.

DAVID J. DELAUBENFELS—*Conifers and Major World Vegetation Types*

It has been customary for conifers to be classified as a major world vegetation type on maps of plant distribution. This situation is subject to question, because the term "conifer" refers to a group of plants distinguished by certain botanical characteristics which are neither of a vegetative nor of a distributional nature. Although conifers are generally xerophytic-evergreen trees, conifers differ greatly from one another, more so in overall physical appearance than they differ from other types of vegetation. Significantly, these differences include leaf-form, and it is not true that the term "conifer" and the term "needleleaf" are even approximately synonymous. Conifers in their different forms occupy a large variety of environmental areas which they share with other kinds of plants, while few if any of these areas can be said to be characterized by conifer vegetation. Of the differences which can be established between conifers and other kinds of plants, none are distributional; conifers as a group have no special distributional characteristics. Perhaps it is the contrast between conifer and broadleaved trees in certain parts of the world coupled with a botanical rather than a geographic outlook on vegetation distribution that has resulted in the classification of conifers as a major distributional type of vegetation. In the light of the above discussion, it is concluded that conifers should not be designated as a major distributional vegetation type.

ROBERT E. DICKINSON—*Dispersed Settlement in Southern Italy*

The compact village, housing most of the peasant cultivators in the commune, is characteristic of Southern Italy. But about 27 per cent of the agricultural population live in dispersed farmsteads, and over large areas there are several hamlets in a commune in addition to the central village. Detailed distribution of settlement throughout the South (based on large-scale maps) reveals a variety of patterns. The component elements are: the compact central village, the hamlet, the dispersed large-scale farm or *masseria,* the permanently occupied dispersed peasant farmstead, and numerous small structures occupied for a few days to a season. Areas with a high degree of dispersion are the Liri valley of South Latium and the Maremma

coastland, the Apennine hills of Campania and north Lucania, the South Murge, northeast of the Abruzzi, and the west coastland of Calabria. The patterns show a close association with the types of economy and size of holding. A compact permanent holding is the obvious prerequisite of a permanent farmstead. The latter has spread widely since the abolition of the feudal system in 1806 through the following trends: adoption of improved rotations and tree crops (olives and almonds) and vines; allocation of communal lands to needy peasants in the 19th century; concession by large landowners of holdings to peasants on long tenures with improvement clauses; purchase of small properties in 1880–1914 and 1919–1933. The current program of land reform continues these trends by establishing peasant holdings singly, in groups, or in series of cooperative cultivation. The general location and spread of dispersed settlement show little relation to specific physical conditions. The *masseria* has been an essential item of settlement for centuries and has been associated with large holdings and a pastoral-wheat economy. The spread of the dispersed peasant farmstead has been associated above all with the guarantee, by purchase or tenure, of permanent possession of an adequate holding.

SIGISMOND DER. DIETTRICH—*Florida's Standard Metropolitan Areas*

Florida is and for the past half century has been one of the fastest growing states in the Union. This study will examine the distribution, growth, and differentiation of Florida's standard metropolitan areas since these played a most decisive role in the growth of the state.

Florida has four standard metropolitan areas. During the first half of the century the growth of these areas was rapid. It ranged from 9,891.6 per cent for the Miami area (Dade County) to the low of 910.6 per cent for the Orlando area (Orange County).

In a comparison with the twenty fastest growing standard metropolitan areas that had 75,000 inhabitants or more in 1950, Florida's areas held their places well. Of these twenty units, four each were in Florida and in California, nine in Texas, two in Oklahoma, and one in Arizona.

Four of the central cities of the Floridian standard metropolitan areas are ports; one lies inland. Despite the similarities there are great differences in their economic functions and structures. These functional differences had their imprints upon the physical growth and appearance of Florida's metropolises as well as upon their economic and population developments.

FRED E. DOHRS—*Geopolitics, Space, and Reality*

Despite the desires for and objectives of one world, the world is confronted with the realities of continuing national state units and conflict of national interests. The development of thermonuclear weapons and their airborne delivery has made a reclassification of space from a geopolitical standpoint essential. Air power transcends land and sea power, making space homogeneous. Ideally, therefore,

geopolitical space becomes a series of concentric zones around the center of the home state, with retaliation against encroachment or aggression in each zone varying directly in intensity with the distance from the home state. Such concentric zones might be labelled as follows: Zone One, the outer ring, area of little geopolitical interest; Zone Two, area of diplomacy; Zone Three, area of conventional weapons; Zone Four, area of thermonuclear weapons; Zone Five, the home territory.

Application of these theoretical zones to the surface of the earth points up the realities of geopolitical space. Applied to the major American commitments the zones result in great distortion of the concentric rings. Applied to the Soviet sphere the zones show marked similarity to the theoretical concentric patterns. The distribution of continental land masses indicates that the theoretical zone pattern could not exist in the present world orientation toward two power centers. The classification does, however, present a new approach to the realities of world space relations and a possible basis for foreign policy.

EDWIN DORAN, JR.—*Ridges of the Southeast Bahamas*

Land forms of the low limestone islands which surmount large shallow banks in the Southeast Bahamas are classified into shallow water, shoreline, plains, and ridge types; their distribution is shown on a map.

Vast shallows are covered by lime sand and in some measure by corals and reefs. Shorelines are usually muddy along the bank sides of islands, are often sandy behind reefs, and frequently are rocky where waves have acted on unprotected hard rock shores. Small karstic scarps less than six feet high usually develop in the latter case, but a few cliffs, up to 100 feet high, have been formed where high ridges are attacked. Considerable areas of marly to slightly lithified plains have formed by accretion and on the inner sides of islands. Slightly higher plains are karstic and result from exposure of shallows by a eustatic drop of sea level. All higher elevations of the islands are produced by ridges of varying character.

Ridges are classified by lithology as sand or rock types, although transitions also are found. Sand ridges are less than 20 feet in elevation. They may occur singly as typical beach ridges but often are in multiple rows, covering several square miles, which appear as a fine striping on air photos. An accretion cycle between ordinary and storm periods, in some cases aided by a eustatic drop of sea level, is suggested to explain their origin.

Rock ridges reach a maximum elevation of 280 feet and have a greatest uninterrupted length of about 40 miles. A subdivision into arcuate and straight ridges based on plan form is substantiated by other differences.

Straight ridges are typically much longer, are oriented more or less at right angles to the prevailing easterly tradewinds, in plan are even on the east border and irregular on the west, have a gentle east slope as compared to a steeper west side, and are intricately and steeply cross-bedded. They seem to be dunes formed from beach sands at their bases and frozen into ridges by rapid lithification.

Arcuate ridges are seldom more than a few miles long, are concave toward a

bight of the sea, may be multiple, are symmetrical in section, and frequently are separated from the sea by multiple sand ridges of lower height. It is probable that arcuate ridges are lithified beach ridges whose greater height results from formation during higher sea stands of the Pleistocene and perhaps from a certain amount of dune action near their crests.

ROBERT R. DRUMMOND—*The Phenomenon of Non-Growth in Terre Haute, Indiana*

Among Midwest cities of its size, Terre Haute, Indiana, is remarkable for its non-growth. The 1950 population census figures for Terre Haute (64,214) and for its metropolitan district (105,160) reveal, respectively, a decline of 2.9 per cent and an increase of only 4.6 per cent since 1920.

Three reasons are paramount in explaining the non-growth of Terre Haute: (1) Following World War I, Terre Haute was subjected to a series of industrial and social upheavals which substantially altered the economic base of the city and its tributary area. (2) Terre Haute was plagued with irresponsible leadership during the 1920's and early 1930's. (3) Due partly to these two causes, Terre Haute did not share in the movement of rural people to the cities after 1920.

The effect of non-growth is reflected in many facets of the life of the city. The exodus of young men due to lack of suitable employment has resulted in an excess of young single women and of retired and aging people. This situation, in turn, is reflected in the low rate of home construction and the small size of the average household.

The city's tributary area has changed little in size. However, the area's shape has become more compact. Only minor changes have occurred in the core area of the city. The relative location of professional, retail, wholesale, and service activities has remained the same.

By shedding its potential population increase to other areas, Terre Haute has reaped some unique advantages. Its public services and schools are not crowded; real estate and rents do not command high prices; dead areas have not developed within the central core; and the level-of-living is on a plane with other Midwest cities of comparable size.

LOYAL DURAND, JR.—*The American Centralizer Belt*

The farmers of the Great Plains, and of the plains-borders, are important producers of cream for sale. This little-known activity of the region extends from North Dakota to Oklahoma, and into the dry lands west of the 100th meridian. It is a feature of all of the agricultural regions—the Spring Wheat Belt of North Dakota, the Corn Belt of southeastern South Dakota and eastern Nebraska, the diversified agricultural regions of eastern Kansas, the Hard Winter Wheat Belt of western Kansas and northwestern Oklahoma, and the Livestock Ranching regions of the Sand Hills of Nebraska, of eastern Montana and Wyoming, and parts of eastern Colorado. The activity is of significance east of the Rockies everywhere from the Canadian border southward to the northern limit of cotton, except in the panhandle of Texas.

Cream production and manufacture of butter in the five states from North Dakota to Oklahoma is important enough to account for 15 to 18 per cent of American butter manufacture, to place the states in the top dozen butter producers, to make Nebraska the fourth state in butter production, and to localize many of the largest creameries in the United States.

The creameries, relatively fewer in number than in the main American dairy regions, are operated by large companies, are located at focal points in the railroad network, and are centered among hundreds of distant cream stations which supply them with sour cream. They are known as centralizers, and collectively constitute the Centralizer Belt of American butter production.

DONALD R. DYER—*Urbanism in Cuba*

The present degree of urbanism in Cuba is high in comparison with other Latin American countries and most parts of the world. The ratio of urban to rural inhabitants is roughly 1 to 1, signifying in part the development of manufacturing and trade in a traditionally agricultural country.

The evolution of urban concentration in the past half century has been gradual and steady, except for the initial decline following independence. The early days of the republic were characterized by the ubiquitousness of small towns, the 1920's by an increasing number of medium-sized towns as the development of the sugar industry and trade proceeded apace, and the present is characterized by large cities and many medium-sized towns.

A striking feature of urbanism in Cuba is the dominance of the capital city, which stands out as one of the world's ten leading examples of marked concentration in the largest city of the nation. The growth of the primate city, both areally and in population, has been rapid, setting the pace for urban growth throughout the country. The picture of urban increase and expansion in Habana and its immediate vicinity is one of piling up in the old city and spreading out to the countryside. The apparent flight to the suburbs, however, has not caused depopulation in the old, formerly-walled city.

Regional differences in urbanism are complex. A few notable features can be cited.

JEROME D. FELLMANN—*The Subdivision Growth of Chicago*

The process of land subdivision and sale on the margins of built-up areas of cities create urban growth patterns showing evidence of areal differentiation in the attractive qualities of available rural land. The growth of Chicago to its present city limits is used as an illustration of the nature of these land-preparation and sale patterns which precede actual occupance of area by urban structures. The areal differentiations implied by the spread of initial subdivision and individual lot sale within Chicago are related to transportation, physical land conditions, and to "the human factor."

The lapse of time, frequently prolonged, between initial subdivision and sale of lots to individuals for building purposes is evidence of both changing economic

conditions and differences in the attitudes of separate groups about the usability of land for urban purposes. These different attitudes, suggested in part by the resubdivision in Chicago, are also an expression of areal differentiation and are discussed. Because the expansion of the built-up areas of cities occurs within a framework of previously subdivided and sold land, the patterns displayed by maps of initial subdivision and lot sale are keys in understanding the outward growth of cities. These "pre-building" growth patterns for Chicago are discussed and are compared with current theories describing the expansion of the built-up areas of cities.

LYLE R. FLETCHER—*Some Observations on Geographic Factors Basic to World Power Status*

This paper presents the thesis that a country gains its position as a "Great Power" as the result of six factors, namely, the population resource, the power resource, the steel resource, industrial know-how, military know-how, and, lastly, aggressive leadership; that any nation having some of these factors will seek to acquire power at the expense of its neighbors and, if successful, will in time acquire Great Power status.

An analysis of the supply of these factors possessed by the various so-called Great Powers indicates that under the definition set up in the paper, the United States is the only "World Power." That is, the United States is the only nation in a position to enforce its ideas on any continent anywhere in the world against determined opposition. Russia, although entertaining ambitions along this line, is only a hemispheric power. Most of the Great Powers of this century have been only continental powers, and Germany was never in a position to be more than a continental power.

The analysis continues by showing the part United States productive effort and solution of the problem of logistics played in bringing World War II to a successful conclusion despite our very great geographical disadvantage, and ends by pointing out the fallacy of our destroying the balance of power by reducing Germany and Japan to a position of impotence by our slogan of unconditional surrender.

DARRYL R. FRANCIS—*Changes of Land Use in the South*

No abstract.

BERL GOLOMB—*Drainage Planning Versus Regional Planning in the Valley of Mexico*

Mexico City, located on the floor of a closed drainage basin, has suffered from floods throughout its history. For over three centuries hydraulic engineers were obsessed with the idea of entirely draining the basin, saving the city from further floods. A 6,600 meter tunnel, constructed in 1608, and an enormous open cut (the Tajo de Nochistongo) subsequently dug along the tunnel's course alleviated

the situation, but complete drainage of the Valley was not achieved till the opening of the Tequixquiac Tunnel in 1900. Undesired effects were felt almost immediately. The shrinking lakes left salt flats, where great dust storms develop. Groundwater from the entire basin flows out the drainage canals, lowering the water table. Lower precipitation efficiencies have resulted. Lessened water pressure has facilitated the consolidation of the saturated sediments on which Mexico City stands, causing the "sinking" of the city. The sewerage system was disrupted. Floods returned, this time by the city's own sewage waters.

Paradoxically, urgent plans now envision *bringing* water into the Valley from the Lerma and Balsas basins, to increase the supply of drinking water for the metropolis. Other recent projects call for storing water in mountain ravines, to combat the "aridization" of the landscape.

Adequate geographical study before the drainage was undertaken could have foreseen the disastrous effects of considering water as an enemy to be rid of at any cost. The substitution of one problem for a batch of others could thus have been avoided. The regional nature of the problems must be recognized, and geographic appraisal must take part in directing the engineers before effective planning, in the Valley of Mexico as elsewhere, can be possible.

MARJORIE SMITH GOODMAN—*A Technique for the Identification of Farm Crops on Aerial Photographs*

Geographers have long been interested in the areal distribution and intensities of production of commercial farm crops. The major problem confronted in studies of farm crops has been the development of techniques which provide both speed and accuracy in field mapping. During the 1930's, it was ascertained that certain features, mostly physical, could be mapped with speed and accuracy from aerial photographs. Aerial photographs have had relatively little use in the mapping of farm crops, however. No definitive method of identifying farm crops on aerial photographs has existed heretofore. This study develops a technique for identification of farm crops on aerial photographs.

The technique rests on descriptions of the ground appearance and the corresponding aerial photographic appearance of selected fields of the major crops in northern Illinois at nine intervals of growth. Secondary emphasis is placed on testing the effects of variations in growing conditions and in farm practices on the aerial photographic appearance of the selected fields.

The study establishes that in northern Illinois (1) the major farm crops can be differentiated and identified on aerial photographs; (2) identification is accomplished primarily through unique tonal and textural properties of the photographic images of like farm crops and through objects which are commonly associated with the crops; (3) variations in physical conditions and in farm practices employed in the growth of given crops have little effect on the photographic appearance of those crops; and (4) photographs taken immediately before small grain harvest have optimum criteria for crop identification.

ARTHUR R. HALL—*Mackinder: Analyst or Prophet?*

After reading his paper on the Geographical Pivot of History, Mackinder stated that it had not been his aim to "predict a great future for this or that country, but to make a geographical formula into which you could fit any political balance." Is the Mackinder thesis more significant today as a correct analysis from which a true geographical formula could be derived, or is it more significant as a correct foretelling of the great future of Russia?

Mackinder's analysis was incorrect in two important respects. First, he contended that the possessor of the Heartland was in a pivotal position, able eventually to dominate the entire world. In the first part of the twentieth century the Heartland did not, in fact, occupy a pivotal position because political power had become concentrated in Europe, and nearly all other parts of the world, including the Heartland, were only in peripheral positions. If there was any one pivotal power it was Germany, as demonstrated by the alignments of states in the two world wars. Second, Mackinder over-emphasized the importance of the World Island in relation to the rest of the world, and he underrated the importance of Anglo-America. Anglo-America has played a decisive part in the power contests of this century and at present serves as an effective counterweight to the Communist bloc seated in the Heartland. Propaganda and subversion have been much more significant in Heartland expansion than Mackinder could have foreseen, and his inability to take such historical factors as this into account illustrates another weakness of any attempt to make a set geographical formula for world power.

In spite of these defects in his analysis, Mackinder was right in predicting that the Heartland power would develop and expand, and in some respects the expansion has been even more successful than he anticipated. The free world alignment against the Communist bloc is also similar to the combination of "insular" and "bridgehead" states that he proposed to counteract Heartland expansion. For these reasons it would seem that Mackinder is more important today as prophet than he is as analyst.

ROBERT A. HARPER —*A Multi-Functional Classification of Cities in the United States*

This paper reports on another attempt to classify the cities of the United States according to their economic functions. In basic method it follows directly from Chauncy D. Harris' famous study of urban function.[1] Like Harris, it uses a U. S. Census table which divides the employed persons in a city into industry groupings. But instead of classifying cities on the basis of a single economic function, as Harris did, this study focuses attention on the multiplicity of functions within each city.

The single-function classification is very useful for teaching and for making generalizations, but in many cases it bases classification on an industry with only

[1] Chauncy D. Harris, "A Functional Classification of Cities in the United States," *The Geographical Review*, Vol. XXXIII (1943), No. 1, pp. 86–99.

a small percentage of the total employed population within a city. In only 12.7% of the 1,251 cities of over 10,000 population in 1950 did the leading industry account for as much as 50% of the total employed workers. And in 22.5% of U. S. cities the leading industry includes less than 20% of all employed workers.

This paper attacks the problem of the functional classification of cities in a manner somewhat like that of Weaver[2] in his recent study of Middle Western agriculture. Multiple function and functional combinations are emphasized. Within a city all industries with at least 5% of the total employed population are considered in the classification. Maps distinguish U. S. cities according to the number of such industries in the city and according to the industry-combinations displayed.

JOHN FRASER HART—*The Changing Distribution of Sheep in Britain*

Hardy sheep bred in the moorlands, or "hills," of Highland Britain are sold as store (feeder) sheep to farmers in Lowland Britain for cross-breeding and fattening. The major pre-war concentrations of sheep in Lowland Britain almost disappeared under the impact of the war-time "plough-up" campaign and increased emphasis on dairying, whereas governmental subsidies maintained sheep numbers in the moorlands relatively well. The dwindling market for store sheep from the moorlands has produced an imbalance which bids fair to continue as long as the major emphasis in British lowland agriculture is on dairying and grain. The imbalance created by the changing distribution of sheep in Britain raises three fundamental questions: (1) To what extent should hill sheep farming be subsidized in the interests of its limited contribution to home food production? (2) As lowland markets for store sheep decline, how can more sheep be fattened in the uplands? (3) To what extent should subsidized hill sheep farming be allowed to monopolize upland areas in competition with other interests, such as water catchment, forestry, recreation, and military training?

It is concluded that, at least until such time as there is a much greater demand for store sheep by lowland farmers, subsidies should be restricted to the more productive hill sheep farms, where some sheep might be fattened despite the poverty of the land. This policy would decrease the cost of subsidies, would reduce the necessity for lowland markets, and would make more land available for other uses.

GEORGE W. HARTMAN—*Geographic Characteristics of Substandard Housing in American Cities*

Attention in this study is directed toward the areal differentiation of substandardness in housing of American cities. "Substandard" housing is used to characterize units that are dilapidated and/or lack basic sanitary facilities. Data contained in the 1950 Census of Housing make possible an investigation of the following topics: What are the variations in the relative degree to which American cities

[2] John C. Weaver, "Crop Combination Regions in the Middle West," *The Geographical Review*, Vol. XLIV (1954), No. 2, pp. 187–200.

contain substandard housing? How are the variations in substandardness areally distributed? What is the statistical nature of the variation in substandard housing with respect to certain associated phenomena?

For the 1,262 cities of over 10,000 population, the per cent of total dwelling units considered substandard ranges from 0.2 to 73.6. Trend changes in the slope of the descending array line appear most noticeably at the percentage values of 7, 13, 28, 35, 44, 51, and 60. When the substandardness values are mapped, however, only the values of 28 and 44 per cent are found to be of isoplethic significance, and seven regions of substandardness in housing are outlined.

A sample of 100 cities is selected to represent the American universe for statistical correlative analysis. "Significant" associations with substandardness are found for a number of quantified factors. An analysis of a series of regression equations indicates that the extent of substandardness in any given city is predicted more accurately through a multiple correlation of several factors than from a single factor of association. Furthermore, it appears that the multiple factors have different associations in the substandard regions than in the United States as a whole.

RICHARD HARTSHORNE—*Analysis of the Heartland Theory*

Discussion of Mackinder's thesis is commonly inconclusive because its key term, "heartland," embodies four different meanings, each of distinctive geographic significance. The World Island of Euro-Africa-Asia has its *geometric center* in the Middle East. In terms of *power* production, it has not one *heartland* but three, all of which are peripheral. No region functions as the *organic node*. In remoteness from the open ocean, the *most internal* area extends from central and northern Asia across the Arctic ice into northern North America. Bordering this "dead center" of the world are the four areas of greatest power, effectively connected with each other by sea routes around the closed area.

The dead center has provided an almost invulnerable bulwark to bordering powers—India, China, Russia, and Canada. Of these, Russia alone has easy access into the productive portion of the enclosed area and to control over its potential routes. Of the powers involved in the main theater of power conflict of the world—Europe—Russia is unique in bordering on this bulwark.

The "heartland" of productive power in Europe, however, is in the German area, which also occupies the strategically central location. The basic validity of Mackinder's thesis results from the unique combination of offensive and defensive strength that would accrue to a power that combined these two areas, each called "heartland" but in quite different senses of the word.

COLBERT C. HELD—*Migration of Industry into Western Germany Since 1945*

Unpublished census figures made available to the writer permit the first detailed study of the significant shift of refugee business establishments into Western Germany. The basic facts and relationships are presented in a series of fourteen maps, from which the conclusions are drawn.

From January, 1945, until September, 1950, more than 85,000 non-agricultural commercial and industrial establishments of all kinds, employing more than 350,000 persons, moved into the German Federal Republic area from former German territories east of the Oder-Neisse Line, the Soviet Zone of Occupation (German Democratic Republic), Czechoslovakia, Saarland, Greater Berlin, and various other countries from which Germans fled or were expelled after 1945. Entering especially between 1946 and 1951, more than 100,000 business and professional establishments had migrated by 1954. Most of them were small, one-man enterprises, such as those of doctors, innkeepers, and dressmakers; but many were sizable industries. One third of the refugee establishments were actual mining and manufacturing (i.e., productive) industries.

This study examines where the businesses came from, especially where they settled in Western Germany, and what kinds of businesses were involved. It then goes on to investigate, insofar as possible, the locational factors attracting the establishments to the new sites. Special attention is given to the mining and manufacturing industries. The study must be concluded several years from now after time has shown how well the new sites served the purpose.

THEODORE HERMAN—*The Location and Organization of Handicraft Industries and Economic Development*

Among the many measures proposed for strengthening underdeveloped economies, there are countless problems of kind, degree, and timing. The improvements that take hold quickly are those that start from activities and needs already known. In many countries handicraft industries meet these criteria, for their techniques and organization are familiar, and they employ many people with little investment.

Many needs must be considered before deciding which handicrafts need assistance from the small sums usually available. Rationally, the order of importance would be determined by such needs as increasing employment, helping depressed areas, using domestic raw materials, earning foreign exchange, preserving traditional skills, training for industrialization, etc.

Economic success for any of these needs requires understanding of the type of market to be served, the optimum location of the industries involved, and the organization of production and marketing. Commercial markets are of three types: local, domestic, and export. The last two divide into mass and luxury goods markets, while the last further divides, in some cases, into demands by overseas nationals and demands by foreigners.

The main requirement for success is maximum access to markets, i.e., where producers can keep in touch with market demands as they change. In some cases this leads skilled workers to shift closer to market, or buyers and supervisors to move to the production centers. Or, it calls for a more direct middleman organization than the traditional one, no matter how close to market production takes place. As governments, both in Asia and Western Europe, take greater part in

handicraft promotion, an understanding of both location and organization will add to the soundness of their efforts.

LESLIE HEWES AND ARTHUR C. SCHMIEDING—*Patterns of Wheat Failure in Nebraska*

Crop failure is an extreme form of agricultural risk in Nebraska and the Great Plains generally. Wheat is the major crop most likely to fail in Nebraska. Since 1931, nearly all parts of the state have experienced high percentages of wheat failure in one or more years. Maximum percentages of failure and maximum numbers of great failures have occurred in the sub-humid central and southern areas rather than in the western semi-arid region of wheat specialization.

Highest failures in recent years in most counties of Nebraska have occurred in one of the following years: 1934, 1937, 1941, and 1944. Counties suffering high percentages of failure in a given year have been clustered, forming one or more regions. In no one year were percentages of failure high in all parts of the state. Although serious failures have been uncommon in the western wheat area since 1937, failures have increased in the central and southern areas during that time.

Federal crop insurance records, beginning in 1939, show the following regionalization of the chief causes of failure: southeast, winterkilling; central and south central, drought; west, hail. For the longer period 1931–1952, the regionalization of causes is similar except for the dominance of drought, rather than hail, in the west. Dry autumns, except in the east, have often been followed by high failure. Reduction in drought damage in the west after 1937 seems a result of both increased rain and improved practices, especially of summer-fallowing.

GEORGE W. HOFFMAN—*Yugoslavia in Transition: Problems and Prospects*

The political geography of Yugoslavia has undergone many changes since the organization of the country in 1918–19. None of these changes had more far-reaching results than those brought about by the break between Yugoslavia and the Soviet Union in 1948 and the emergence of a "national communism."

Not only were the external relations of Yugoslavia affected, but domestic policies, often imitating the Soviet Union, were also reviewed. Yugoslavia's economy, geared to trade with the Cominform countries, was suddenly without vital and long-promised machines and raw materials. Long-term plans embodied in her Five Year Plan had to be postponed or completely abandoned, and a new political and economic relationship with the West had to be worked out. The changed political geography also affected the internal structure of the country and is expressed, e.g., in a new structural relationship between the national government and the federal states. For the first time in the history of Yugoslavia a unifying idea, a *raison d'etre*—national communism—gives the people something resembling national unity.

The transition in the Yugoslavian society and economy, which started at the outbreak of World War II, still continues. Policies of collectivization and industrialization are of utmost importance to the well-being of the country. With nearly

two-thirds of the population still deriving its income from agriculture, the solution of basic economic problems naturally depends upon the outcome of industrialization. But this success is closely tied to an increasing agricultural output and a decrease in rural overpopulation. Closely related are the solutions to such problems as the payment of the large foreign debt, improving the balance of payments and paying for materials needed for further industrialization, eliminating transportation deficiencies, raising the cultural level of backward peoples through education, etc.

Solving the many social, economic, and political problems within the framework of a federalized national communistic state is a difficult task which will require much cooperation between the different peoples of Yugoslavia. Yugoslavia's relations with the countries East and West will greatly determine whether the newly found *raison d'etre*—national communism—can become a permanent factor in the political geography of Europe.

J. C. HOOK—*Areal Differentiation of the Density of the Rural Farm Population in the Northeastern United States*

The problem involved in this work may be stated as follows: What factors are associated with, and can help explain, the areal differentiation of the rural farm population of the northeastern United States? This paper has a second purpose in that it will attempt to illustrate the value of multiple correlation in geographic research of this type. Most of the following computations and generalizations are based on a random sample of 100 counties from the area under investigation.

The first phase of the investigation was concerned with relationships between the physical environment and the rural farm population. It was found that differences in population densities are slightly associated with differences in roughness of land (measured by a "roughness index" based on the density of contour lines in a county), differences in relative relief, and differences in the length of the growing season. It was also found that variations in the rural level-of-living index are associated with variations in the physical environment.

The second phase was concerned with the influence of metropolitan centers. Bogue, in his work on the *Structure of the Metropolitan Community,* has shown that the density of the rural farm population decreases as the distance from metropolitan centers increases. This study substantiates Bogue's findings to some extent. The amount of land in a county that is in farms also has a relationship to the density of the farm population.

The relationships between the rural farm population and some of the above variables may be described by the multiple regression equation:

$$REP = .236\ LIF + .021\ GS - .035RI - .046DIM + 3.37$$

where REP is the density of the rural farm population per square mile, LIF is the percentage of a county that is in farms, GS is the average length of the growing season in days, RI is the "roughness index," and DIM is the straight line distance from the center of the county to the nearest central city of a metropolitan area with a population of over one million. The coefficient of multiple correlation between

these factors is 0.78; the standard error of the estimate is 4.3 persons per square mile.

When differences between actual population densities and those predicted from the above formula were mapped it was found that the greatest deviations occur in eastern Pennsylvania and central West Virginia.

McDONALD K. HORNE, JR.—*United States Cotton in the World Economy*

No abstract.

CHIAO-MIN HSIEH—*Hsia-ke Hsu (1586–1641)—A Great Geographer in China*

Western histories of the study of geography have up to now paid virtually no attention to the development of this science in Asia. Yet we have had great geographers and one of the greatest of these in China was Hsia-ke Hsu.

Hsu was born in 1586 at Kiangying, in Kiangsu province, and died there in 1641. He was well versed in classics, but his passionate love of natural scenery led him to abandon the more normal course of taking the state examinations and entering upon an official career. Instead he devoted his life to travelling and writing of what he saw. His travels began in 1607 when he was 22 and continued until his death at the age of 55. In his early years, he travelled to the five sacred mountains of China and visited many famous lakes. Thus the provinces of Shantung, Hopei, Shansi, Shensi, Kiangsu, Chekiang, and Fukien all bore his footprints. The journey to the southwestern part of China, his last one, took four years and resulted in important discoveries. Hsu's greatness lies not only in his explorations, but in his voluminous, beautifully composed diary written day by day on his journey. His diary covered 850 days, amounting to about 500,000 words, thus averaging nearly 600 words a day. All his travels were on foot with poor equipment. This makes his writing all the more remarkable.

Hsia-ke Hsu's main contribution to geography can be summarized as follows:

1. It was Hsia-ke Hsu who discovered that the Kingsa Kiang (Gold Sand River) was the true source of the Yangstze instead of Ming Kiang. He also recognized the true source of Hsi Kiang (West River). In addition, he had a clear conception of the Mekong and the Salween as separate rivers.

2. He was a pioneer in mountain geography in China. When he climbed the Yunnan-Kweichow plateau, he noticed the vertical distribution of vegetation and temperature and tried to explain it in its relation to latitude and elevations. He made careful studies of the underground water, and gave a beautiful description of the Karst topography which prevailed in this limestone area.

3. His diary recorded the topographical details of routes and directions, so that it was widely used by the Western missionaries in compiling the maps of China at the beginning of the China Empire in the 17th century.

4. Most of Hsu's writing was empirical description, but he had such a rich power of analyzing landform details that he was able to coin a systematic landform terminology which laid a foundation for modern Chinese geographers to follow.

5. In Hsu's diary, there are innumerable beautiful passages describing the landscape. His writing will live not only as a scientific document of his time, but a piece of classical Chinese travel literature.

Hsia-ke Hsu's observation of the landscape was keen, his description of the land was vivid, and his explanation of the natural phenomena was reasonable. His eager search for truth and passionate love for natural scenery were great. With his great skill and deep enthusiasm, he was a figure who can be ranked as the great forerunner of modern geography in China.

ROBERT E. HUKE—*Land Use in an Irrawaddy Delta Village*

Sixty-five miles south and west of Rangoon lies the tiny settlement of Tadagyi, representative of thousands of similar agricultural villages in the Irrawaddy Delta. Its thirty-two homes are located on an ancient laterite block, which rises about forty feet above the surrounding sea of paddy lands. Rice farming is the principal occupation.

Average farm size here is somewhat over nine acres, but the median size is only eight acres, indicating that a small number of village farmers hold substantially larger plots than do their neighbors. Operating units have decreased in size through inheritance and through debt, but farms have not yet become fragmented. Local money lenders and the National Government own 89.4 per cent of the rice land while the villagers maintain ownership of their home and garden plots.

Most of the village land is planted to a single crop of rice. A few scattered fields, close to the village site, are used intensively to produce vegetables as a hand-irrigated crop following rice. Almost every family has a minute vegetable garden in the home compound and several raise thatching material in the tidal flats.

Experimental farms in the area produce two crops a year utilizing mechanical irrigation. By efficient use of fertilizer these farms also maintain far higher rice yields than do the farmers at Tadagyi. While mechanization appears ill suited to this area, it is believed that yields and village income could be doubled by using methods found at the experimental farms.

FREDERICK HUNG (HUNG FU)—*Notes on the Historical Geography of Taiwan*

The geographic name *Taiwan* has three meanings: (1) the main island with an area of 13,808 square miles; (2) the Taiwan group of islands which includes besides the main island seventy-eight small islands offshore with a total area of 29 square miles; and (3) the Chinese province of Taiwan (created in 1885) which comprises besides the Taiwan group the Panhu group (Pescadores) of sixty-four islands. The whole province has a land area of 13,886 square miles. The population, according to the figures issued by the Provincial Government on October 18, 1954, was 8,438,016 (not including servicemen).

The Panhu group of islands was annexed by the Chinese general Ch'en-Leng during the reign of K'ai-Huang (A. D. 581–601) in the Sui Dynasty. In 607 the

Emperor Yang sent an armed party of explorers to the Island of Taiwan, followed three years later by the same Ch'en-Leng. During the "time of troubles" of the Five Dynasties (907–960) and the Yüan (Mongol) Dynasty (1280–1368) Chinese refugees flocked to the islands, the Panhu group being the first to be settled by emigrants from the mainland. The Ming Dynasty (1368–1644) at first prohibited emigration to the islands, but reversed its policy during the reign of Ch'ung-Chên (1628–1644) when several tens of thousands of starving people from Fukien settled in Taiwan, aided by the government that supplied them with funds and with the necessary draft animals.

The first Europeans to visit the island were the Portuguese in the early sixteenth century who gave it the name of *Formosa,* "beautiful," as a tribute to its magnificent scenery. Taiwan was occupied by the Dutch from 1624 to 1662. The Chinese general Cheng-Ch'en-Kung (Koxinga) defeated the Dutch at sea and on land, and the islands again flew the Chinese flag. Cheng converted the island into a naval and military base for operations against the Ching (Manchu) Empire on the continent. After twenty-two years of independence, it was finally absorbed by the Empire through peaceful means.

This Chinese province was ceded to Japan by the Manchu Court in 1895. It was not returned to China until the defeat of Japan in 1945.

J. ROWLAND ILLICK—*Some Locational Considerations in the Distribution of the Primary Turnery and Specialty Mills in Northern New England*

The primary turnery and specialty mills are favorably located in northern New England (Vermont, New Hampshire, Maine). Primary wood users are manufacturers which secure raw material as logs direct from the woods, process them for immediate use, or pass them on for further manufacture. In contrast, secondary producers purchase stock from primary industries in unfinished form and cut to specified dimensions. Northern New England's 241 primary turnery and specialty mills (1950) employ numerous processes to manufacture a wide range of products from hardwood logs (birch, beech, maple, oak, ash) less than 8 feet long and larger than 6 inches in diameter. Small veneer items, bobbins, heel stock, dowels, novelties, toys, spools, handles, excelsior, furniture and an assortment of bentwood products such as toboggans, skis, and baskets, suggest the diversity of products.

Whether one-man enterprises or large plants employing many hands, the important locational incentives—raw material, markets, transportation, labor, power, and water—are generally more than adequate here. Lesser advantages, such as diversity of forest species, fairly rapid forest regeneration, stimulating climate for labor, proximity to centers manufacturing wood-working machinery, and attractiveness of rural villages for workmen's homes, enhance the suitability of the region. Locational handicaps—the effects of occasional hurricane winds, forest fires, tree diseases and insect pests, and man's negligent or prodigal use of the forest—can be minimized in time. In general, the industry is in balance with local forest resources. Consequently, a greater number and a larger variety of primary turnery and specialty mills are located in northern New England than in any adjacent area.

W. A. DOUGLAS JACKSON—*The Virgin and Idle Lands of Western Siberia and Northern Kazakhstan*

The current project to create in western Siberia and northern Kazakhstan a vast wheat base, comparable to the famous Ukrainian granary, is the most recent scheme devised by Soviet leaders to transform the agricultural geography of the U.S.S.R. In the forest steppe and steppe regions beyond the Urals, millions of acres of alleged virgin and idle lands are to be put to the plough and sown to wheat and other grains. Large, new, mechanized state grain farms are to be organized and staffed by scientists, specialists and farmers, etc., in a mass migration from the European part of the country.

Although G. M. Malenkov stated at the 19th Party Congress in 1952 that the grain problem had been solved, the directive of the February–March (1954) Plenary Session of the Communist Party called for an expansion of the sown area by 32 million acres during the next two years (later increased to 37 million for 1955, and to 75 million for 1956).

Since it is generally assumed that all of the better agricultural land in the Soviet Union had been utilized as early as World War I, it is difficult to determine with any degree of accuracy the reliability of Soviet claims of vast reserves of unused arable land, or to estimate the possibility of achieving positive results on such land. Obviously, the Soviet use of the word 'arable' is broader than the western concept, and without doubt embraces land which, from our point of view, is distinctly marginal. At any rate, the current project is based on the assumption that up to 99 million acres of virgin and idle 'arable' land exists in the U.S.S.R., between the Volga River and Lake Baikal (and including the North Caucasus).

Recently published statistical data on the oblasts of northern Kazakhstan indicate that of 68 million acres of tillable land, only 25 million acres have been ploughed. In individual oblasts, virgin and idle lands occupy as much as 60 per cent and more of the "potential." The situation is similar in the oblasts of western Siberia, although data of a strictly comparable nature are not readily available. Hence, of the 32 million-acre increase demanded, nearly half (15 million acres) will be in northern Kazakhstan and 9 million acres in Siberia (mainly the western oblasts).

However important a role institutional, material, and human factors might play in determining the success or failure of this grandiose program, climatic and soil factors will ultimately bear a major share of the responsibility and consequently must occupy a pre-eminent position in the assessment of the agricultural potentialities of this vast region. Erratic and insufficient precipitation, coupled with soils low in humus, or markedly salty, underline emphatically the very marginal nature of much of the alleged reserve.

Soviet leaders have indicated that they expect to obtain high and steady yields of spring wheat from the virgin and idle lands. Yet, throughout much of this region yields have not been historically high. Moreover, in the southern reaches of the steppe in the early 1930's, a vast program to organize productive state grain farms met with complete failure.

Under a system of dry farming it is essential that land be allowed to fallow

in order that moisture may be accumulated and fertility restored. Yet, in the extreme conditions of the eastern regions of the Soviet Union, the practice has been to sow wheat year after year on the same field. Although a considerable emphasis has been placed on the introduction of proper crop rotations since the war, the "travopol" system has not been successfully nor extensively adopted. In fact, crop rotations are only nominal and the land continues to be exploited under wheat.

Utilization of the virgin and idle lands is an attempt to remedy this situation by providing fresh land for wheat and other grains, while retiring old plough land whose productivity is fast failing. Reserves of idle land within a region of hazardous soil and climatic conditions seem to be extensive; yet Soviet plans will have to be geared to the vital problem of conserving moisture. In short, this means the application of advanced agronomic principles to a very large territory. In view of past Soviet experience, particularly in this very region, one may question the degree to which this current project will meet with success.

HILDEGARD BINDER JOHNSON—*Traditional and Ecological Aspects of the Quarter Section*

After presentation of a "land description" under the metes and bounds system, the rules of the rectangular land division system are outlined. Roundly 1200 claims registered in the land office at Winona, Minnesota, in 1855 were studied as to location, shape, and character. The topography and relative location of a natural region, the Whitewater watershed in southeastern Minnesota, at the time of the first transfer is described. The succession of claims and the prices paid at a public sale in November, 1855, permit conclusions as to preferred location, value of the land, and problems arising from application of a rationally conceived simple system.

Two recent examples of land assignment in Germany are presented, one of *Flurbereinigung* in Hessen, where regionalism of religion defeated the reorganization work of many years, another of resettlement of eastern expellees in the Eiffel, where, on the site of a razed village, uneconomic traditional field divisions were revived for legal reasons.

The comparison between examples of old and new world traditionalism is invited through the observation of effects that result from ignoring ecological principles in land division. Measures are being tried to facilitate usage of land that is more economic and in keeping with natural conditions. Numerous and many-sided efforts, usually labelled *Raumplanung* in Germany, and recent legislative measures in the United States concerning watersheds, are caused partly by the disadvantages resulting from traditionalism of different character, duration, and intensity.

TIM K. KELLEY—*Queensland's Channel Country: Nature's Irrigation System*

The Channel Country of far southwest Queensland, the best natural cattle fattening area of Australia, has developed from an involved and unique series of inter-

laced stream branches. Located in a zone of unreliable and sparse rainfall, which varies from 5 to 9 inches a year, its productivity is derived from the more or less periodic floods of its three major rivers. These streams, which head in the wetter monsoonal lands of the north, flow into areas of increasing aridity downstream, occasionally wetting the bed of Lake Eyre.

Here all natural features exist in a most delicate balance. Rivers have reached grade with a monotonous slope of 10 inches to the mile. Sandhills are finely adjusted to climatic conditions. Soil fertility is directly related to brief dousings by water. The equilibrium in which all these natural features exist is the clue to present and possible future land utilization. A debit disturbance of the balance, either naturally by prolonged drought or artificially by overstocking, will show immediate reaction.

Two main factors now restrict development: erratic seasonal conditions and the lack of transport facilities. Little can be done to stabilize seasonal conditions beyond good management to alleviate its effects. But it is evident that transport to ensure that "stores" can be moved in quickly when seasonal conditions for fattening are most favorable, and "fats" can be taken to market or other fattening areas when conditions are adverse, would increase the "turnoff" in both quantity and quality and stabilize the industry of the area.

WILFRID D. KELLEY—*The Growth of Albuquerque: Spanish* Villa *to Metropolitan Area*

The growth of Albuquerque over the past 249 years has closely reflected the development of the Southwest. Established in 1706 as a tiny outpost to protect the route from Santa Fe to Chihuahua, it has become the chief commercial center of New Mexico with a metropolitan population of 150,000.

For its first 140 years the *Villa* of Albuquerque was an unimpressive village on the Rio Grande floodplain, composed of a church, a plaza, and a few houses, which served as the religious and administrative center for the *rancheros* of the vicinity. After 1846 a few merchants established stores around the plaza, but there was still little to distinguish it from other villages along the river.

Development of the modern city began with the arrival of the Santa Fe railroad in 1880. The railroad bypassed the *Villa,* but enterprising citizens laid out at the tracks a New Albuquerque, which thrived on rapid territorial development in stock-raising, mining, and lumbering and replaced Santa Fe as regional commercial and financial capital. Establishment of federal defense facilities during World War II and increased traffic on U. S. 66 led to a tripling of population and a tremendous areal expansion beyond the floodplain. In the floodplain, urban expansion has engulfed the old *Villa* and other old nuclei of settlement and created a complex pattern of intermingled rural and urban land uses.

How long Albuquerque can remain the nation's fastest growing city now depends on the development of an adequate water supply for new industries which

could absorb the region's rapidly increasing population and on the continuance of federal expenditures.

CLYDE F. KOHN—*Resort Settlements Along the New England Coast*

As a type of settlement, holiday resorts have arisen in our country, and elsewhere, to perform a particular service function. They provide for the recreation of an ever-growing segment of our population possessing increased leisure and the financial means to enjoy it.

The numerous seaside holiday resorts that exist along the New England coast are themselves susceptible to classification. Two main classes may be established: (1) the holiday resort composed entirely, or nearly so, of seasonal dwellings occupied only during the warm part of the year; and (2) the resort made up, in different degrees, of both year-round and seasonal dwellings and offering a variety of commercial, social, governmental, and other services. It is with the first of these—the seasonal holiday resort—that this paper is concerned.

Six types of seasonal holiday resorts may be established on the basis of the arrangements, spacing, and size of dwellings. These are:

Type 1: The dispersed holiday resort.
Type 2: The agglomerated holiday resort with dwellings linearly arranged, compactly spaced, and small in size.
Type 2B: The agglomerated holiday resort with dwellings linearly arranged, but not so compactly spaced, and larger in size.
Type 3A: The agglomerated holiday resort with dwellings irregularly clustered, compactly spaced, and small in size.
Type 3B: The agglomerated holiday resort with dwellings irregularly clustered, but not so compactly spaced, and larger in size.
Type 4: The agglomerated holiday resort with geometrically (principally rectangularly) platted properties.

The density of dwellings within these settlement types appears to be a result of (1) the time at which the settlement was first established, and (2) the income of property owners. The location and size of each of the holiday resort types reflect clearly the values attached to particular sites by property owners.

CLYDE F. KOHN—*The Identification of Farm Crops on Selected Aerial Photographs*

Farm crops in northern Illinois, like most other features of the natural and cultural landscape, can be identified on aerial photographs. Unlike other features, however, farm crops change in their photo appearance during the growing season as a result of growth, maturation, cultivation, and harvest. These changes affect photo identification. All crops of the research area can be identified on aerial photographs some time during the growing season; some crops can be identified on all aerial photographs taken throughout the growing season. On some aerial photographs it is possible to identify every crop grown in the area.

The identification of farm crops on aerial photographs selected at random from the nine sets of photographs used in the study serves three objectives. First, it gives the photo analyst an orderly method of procedure to follow when identifying farm crops on photographs taken at particular times during the growing season. Secondly, it demonstrates the extent to which the various farm crops can be identified at different times of the growing season. Finally, it delimits the time during the growing season when optimum criteria are available for photo identification of farm crops in the research or analogous areas.

The procedure of identification of farm crops taken at any particular time during the growing season consists of two steps. The fields are first grouped on the basis of outstanding photo properties shared by two or more crops. After a field has been so classified, the photo interpreter then proceeds by known criteria to determine the precise identity of each crop.

HUEY LOUIS KOSTANICK—*Turkish Resettlement of Refugees from Bulgaria, 1950–1953*

On August 12, 1950, the Bulgarian government announced that it would expel 250,000 persons of Turkish descent from Bulgaria to Turkey within a three-month period. This initiated a mass movement to Turkey during 1950 and 1951 of over 140,000 Turks, who were subsequently resettled in the western areas of Turkey by the Turkish government. Further migration was stopped, pending additional agreements between the two governments.

The expulsion was primarily a political move by the Bulgarian Communist government to rid itself of a large and prosperous minority, to gain valuable lands for the formation of vast collective farms, and to create a serious burden on the Turkish economy by forcing Turkey to absorb a sudden influx of thousands of immigrants. In 1950, there were in Bulgaria some 680,000 Turks, most of whom were settled in the fertile Dobrudja and Deli Orman areas of northeastern Bulgaria. In addition, there were 120,000 Pomaks (Moslemized Slavs) and some 10,000 Tatars and Gazaouz, who speak Turkic languages.

Turkish reaction was to welcome these immigrants as refugees from Communist persecution. In fact, the refugee question became a matter of national pride, particularly because Turkish troops were actively fighting in Korea and the Soviet Union was pressing territorial claims in eastern Turkey. Resettlement plans were based on policies that refugee families were to be assigned to areas in Turkey with geographic environments similar to those in Bulgaria, to practice the same type of profession, and to be amalgamated into existing Turkish communities rather than established as separate units.

The Turkish resettlement program was a marked success because of a favorable economic situation due to lack of wartime destruction, increased agricultural production during a period of high prices, and large-scale aid from the United States under the Marshall Plan. The chief criticism of the program is that, in many cases, insufficient farm land was allotted to families.

EARL E. LACKEY—*Determining the Reliability of Probable Temperatures*

Assuming that the sample is truly representative of all the measures in a given temperature distribution, then the reliability of the sample for an appraisal of probable temperatures depends upon the number of observations. In order to apply the tests of reliability it must be known also whether the sample has a symmetrical or a skewed distribution.

With these conditions established, and by the use of a standardized worksheet, a table of reliability factors, and two types of probability scales, it is possible to determine (1) the average temperature, (2) the probable deviations from the average, and (3) the reliability of these measures in terms of the *standard error of the average or the skew error of the mode.*

The method may have wide application in the appraisal of long-range probabilities in numerous fields. It is the purpose of this paper to demonstrate the simplicity and efficacy in this procedure.

TREVOR LLOYD—*Reconstruction of North Norway 1945–55*

Finnmark, the northernmost Norwegian province, and part of neighboring Thoms were systematically devasted by retreating German armies during the 1944–45 winter. Destruction was almost total in many areas. Hammerfest and other settlements in the western part were obliterated and Kirkenes and Vardø in the eastern part, where wartime bombing had already caused great damage, were almost destroyed.

With the end of hostilities, Norway was confronted with the urgent need to rebuild the economy of the area, reconstruct houses, resettle population, most of whom had been evacuated, and recreate the normal channels of existence. All of this had to be done a long way from supplies and administrative centers.

This study reports the manner in which the project has progressed during the decade of 1945–55. Conditions immediately prior to the war are summarized as a background. The extent of destruction in various areas is assessed. Problems faced in reconstructing the economy are stated, and the successive stages of temporary alleviation of hardships, long-term reconstruction, and eventually an expansion of the economy through new construction are described. The influence of long-established practices and the desire to rebuild along traditional lines is contrasted with the urge to plan a new community in the far north. The influence of the physical environment on these developments is outlined. Complicating factors in the reconstruction of north Norway have proved to be the proximity of the closed U.S.S.R. frontier and the strategic importance of north Norway with the consequent use of man-power and finance for defense purposes.

Particular stress is placed in this study on the essentials of the new economy—transportation by sea, land, and air; the fishing industry; mining and the provision of cheap electric power. Future trends in these industries are suggested. Other topics are the likelihood of expansion in settlement and the raising of living standards; the possible influence of closer collaboration between Norway, Finland, and

Sweden in the far north, the influence of economic and other ties with the Soviet Union that might accompany opening of the international border.

RICHARD F. LOGAN—*The Shifting Patterns of Travel in the Southwestern Deserts*

The desert presents great obstacles to travel: surfaces difficult to traverse and lack of food, water, and forage. These have been overcome at various times in different ways, depending upon the technological stage. This is well exemplified by the routes of the eastern Mojave Desert—a basin and range area.

The aborigines were a hunting-gathering people who traveled afoot. They avoided the waterless alluvial basins, living in the mountain-foot areas, where water and food were available, and, for similar reasons, along the Colorado River. Their seasonal migrations avoided the basins, following the mountain-foot from spring to spring and traversing all types of surface and slope.

At first, the white man did little to change the picture. He and his pack animals had the same basic requirements as the Indians; hence similar routes were used. Wagons later followed slight modifications of these same routes.

It was the railroad that completely reversed the picture. Requiring smooth surfaces and gentle slopes, it traversed the basins and avoided the mountains. Water, hauled in quantity, permitted the establishment of basin towns, to which local routes were soon re-oriented.

Early automobile roads paralleled the railroads. With pavement and improved engines, these routes have been straightened, but they still traverse the basins, using the easier grades.

Thus a complete reversal of the population and transportation pattern has occurred: the once-important mountains are now uninhabited, and the once-empty basins are now the foci of routes and populace.

JAMES S. MATTHEWS—*Sequent Occupance in Memphis, Tennessee: 1819–1860*

A rapid movement of settlers into West Tennessee began in 1818, when the Chickasaw Indians ceded their claims to lands lying north of the 35th parallel between the Tennessee and Mississippi rivers. Memphis was one of several small towns established in that region. It was laid out in 1819 in the extreme southwest corner of that area on a high bluff undercut by the main channel of the Mississippi River. Keen competition developed among those towns for the limited trade of the region, and not until 1849 was the dominance of Memphis generally apparent.

The first two decades of settlement in Memphis were characterized by rapid population growth. From a total of 53 settlers reported in 1820 the number increased to 663, then to 1,800 in the two succeeding decades.

In the twenty years from 1840 to 1860 Memphis grew at an extremely rapid rate. It was the fastest growing city in the United States during the ten years ending in 1850, when its population increased about five-fold. In the decade after 1850 the number of inhabitants more than doubled, reaching approximately 23,000

in 1860. In that year Memphis was the fourth largest city in the South, only New Orleans, Mobile, and Louisville being larger.

Important population developments occurred also in the rural areas surrounding Memphis during the four decades after 1820. Growth of settlement was slow on the bottom lands east of the Mississippi River prior to 1830 and rapid thereafter, since, fearing malaria, people at first avoided them. In the inland counties of West Tennessee settlement proceeded rapidly until 1840, after which there were only minor gains. On the Indian lands of northern Mississippi, ceded in 1834, settlement was similarly rapid from 1835 to 1850, when the rate of increase declined sharply. In the swampy eastern counties of Arkansas, population grew slowly through those four decades, although the growth was somewhat more rapid after 1850 as artificial drainage was beginning to appear.

From 1819 to 1860 the expansion of the livelihood structure in Memphis paralleled the growth of population. By 1860 the value of trade in Memphis amounted to almost $52,000,000 annually, cotton alone accounting for more than 35 per cent of the total. In 1825 manufacturing in Memphis was limited to grist and sawmills and a blacksmith shop, while in 1860 a highly varied list of products, valued at over $4,000,000 amounted to about 8 percent of the value of the local trade. During those 41 years there occurred many transportational developments of importance to the economy of Memphis. For the first 20 years flatboats moved most of the goods into and out of Memphis; however, roads, steamboats, and finally railroads were added. With each improvement of the means of transportation the Memphis trade area was enlarged and increases in both trade and population were stimulated.

SHANNON MCCUNE—*Geographic Diversities in Southern Tohoku, Japan*

Southern Tohoku is a transition zone between subtropical old Japan and the cold-wintered frontier lands of the north. In order to observe the geographic diversities within this area and draw conclusions concerning its potential development, four reconnaissance cross-sections, roughly following the 38° parallel, were made in 1953 and 1954 with Tokyo University students.

Along the Pacific coast, south of Sendai, fishing, formerly dispersed, is being concentrated in large ports. The narrow ribbon of east coast lowlands is intensively used for winter and summer crops. In the adjoining hill lands silk, cereals, and forest products provide a limited income for the sparse population. Extension of cultivated land in the mountain areas (for example, on the slopes of Mt. Zao) is extremely difficult, though now being attempted. In interior basins, such as the Yonezawa Plain, mid-way across the area, rice predominates, but on their margins grapes and dairy products diversify the economy. In isolated mountain lands modern industrial plants, based on hydroelectric power, are exotic features in the forested landscapes. On the Echigo Plain, north of Niigata, rice fields sharply contrast with pine-covered sand dunes. Drag-net fishing is common along the Sea of Japan.

This cross-section well illustrates Japan's geographic diversity. Geographers

studying this area are oppressed by problems posed by increasing populations striving to maintain adequate standards of living on lands with limited resources. The future, though dim, depends upon effective utilization of the diversified geographic base.

CHARLES B. MCINTOSH—*Coal Mine Explosion–Weather Relationship*

There are two types of coal mine explosions: those resulting from the ignition of methane and those resulting from the ignition of coal dust. The coal miner has long associated coal mine explosions with stormy weather.

Experimentation indicates that the amount of methane in the working entries of a coal mine is quite often doubled and may even be tripled with the passage of a low pressure system. The increase in methane varies with the depth and speed of movement of the low pressure center. Coal dust was found to lose 7 per cent of its moisture content within 24 hours after a cold front passage, 11 per cent within 42 hours. Changes in weather and climatic elements thus effect changes in the explosive elements within coal mines.

Some 365 major explosion disasters in the United States from 1881 through 1953 were mapped. The pressure, temperature, and water vapor readings associated with these explosions were assembled. The average of the pressure readings indicates that E-day has lower readings than the 3 previous or 3 following days. This is most evident in anthracite explosions, where coal dust explosions do not occur. Vapor pressure patterns show dry air in the mine prior to E-day. Frontal passages occurred on 115 E-days, over 70 the day prior to E-day. Sequence explosions associated with the W-E movement of cyclones have been detected.

Evidence may warrant specialized and localized warnings indicating period of excessive explosion danger in coal mines.

MARY MEGEE—*Historical Geography of Mining in the Tri-State Lead and Zinc District of Missouri, Kansas, and Oklahoma*

The Tri-State District is located and the most important zinc-lead fields are mentioned. The nature of Tri-State ores and their probable formation is dealt with briefly.

A historical geography of zinc-lead mining and uses of these non-ferrous metals are traced from 1848 to the present. There are four periods based on stages of mining development and significant events occurring in each period. Known areas of mineralization were limited to southwest Missouri and Galena, Kansas, during the period 1848–1880. The period 1881–1917 was the one of greatest expansion of new fields in the District. Missouri outranked Kansas and Oklahoma in production. The discovery of the great Picher Field was a significant event. During the period 1918–1928 Oklahoma led in Tri-State production. The years 1925 and 1926 were peak years for District lead and zinc production respectively. The period 1930–1954 was marked by several significant events, the most important of which were the depression of the early 1930's, the construction of the world's largest con-

centrator which saved many mines from closing down, and two wars with accompanying mechanization to replace labor lost to defense.

Today with lead and zinc production on the decline in the Tri-State District, ways of prolonging the mining industry are being attempted with emphasis on the development of new industries relating to by-products of the smelting process: cadmium, germanium, gallium, and sulfuric acid.

PEVERIL MEIGS—*Hurricanes and Rain in Southern Baja California, Mexico*

This paper, part of a study of world coastal deserts and sponsored by UNESCO, discusses hurricanes and their relationship to rainfall in southern Baja California. It digests unpublished rainfall data for twenty stations south of 28°N.

Published means of rainfall for this area are misleading. The mean annual rainfall at Bahía Magdalena, for example, widely cited as 10.4 inches on the basis of a four-year record, is reduced to 4.8 inches by a 15-year record. The old mean is distorted by the inclusion of the year 1939, when an exceptional hurricane brought 10.8 inches (more than twice the annual mean) in a single day.

Hurricanes (*chubascos* in local parlance) come nearly every autumn to Baja California, contrary to earlier statements that they occur once every three or four years. During a 13-year period, at least 15 hurricanes struck the peninsula in at least 10 years. Most of them originate in the Pacific off the Mexican coast between 10° and 20°N; a few come from over the Gulf of Mexico. Those that reach Baja California usually swerve to the east and die out in Sonora or Sinaloa. Rarely do they reach California or Arizona.

As a result of hurricanes, several Baja California weather stations have registered over 20 inches of rainfall in a single month, and at one mountain station 40 inches fell in September 1949. Examination of day-by-day records confirms the credibility of such figures. Damage to towns, roads, and shipping resulting from such storms is serious, even in so sparsely-settled an area.

ALEXANDER MELAMID—*Thuenen and MacKinder: Spatial Economic Theory and Political Geography*

Due to the similarity of the functions of accessibility, weights, and values in Thuenen's hypothesis of spatial distribution (Thuenen's circles) and in Mackinder's hypothesis of heartland/world-island relations, the two theories complement each other. This is no mere accident, for Thuenen's concepts can be recognized frequently in political geography. For example, boundary zones, which used to separate states and tribes in earlier eras as described by Curzon and others, are equivalent to Thuenen's undeveloped area beyond the circles of regular economic production. Due to population pressures, etc., boundary zones have evolved into linear political boundaries in recent centuries. However, Thuenen's undeveloped area can still be recognized in boundary regions, for boundaries impede access to adjacent territory and thus reduce the scope for economic development. Loesch has described this lack of development as "Grenzoede" (boundary emptiness)

which corresponds principally with Thuenen's undeveloped area. The spatial evolution of modern states out of feudal territories and colonial areas can also be described with the help of Thuenen's concepts. The significance of Thuenen's work is thus not limited to problems of relative location in agricultural geography. In particular the empirical work of political geographers like MacKinder may be reinterpreted with the help of the abstract concepts of Thuenen and other economists.

DAVID H. MILLER—*Landscape and Climate: The Joint Effect of Snow Cover and Forest on a Local Climate*

The anomalous local climate that occurs between storms in spring in the crest region of the Sierra Nevada is largely the creation of the natural landscape. Components of the landscape are an extensive, deep snow cover and scattered, open stands of pine. Their reaction to the strong flux of radiation that reaches the region through sinking air aloft is an important part of the physical geography of the region.

A statement of the thermal economy of the snow illustrates the roles of these components of the landscape. In a typical day, heat gain is 270 calories per sq. cm. by absorption of solar radiation, and 120 calories from the air, mainly by transfer from the sun-warmed foliage. In passing from trees to snow through the local air of the region, this heat produces the characteristic high daytime temperatures known to every skier. Some of the water melted by the high energy input to the snow remains near the surface; when it re-freezes, 40 calories, on the average, are released and prevent night temperature from dropping much below freezing.

The classic concept of the effect of snow cover on climate, which calls for cool days and very cold nights, does not fit this region, where nights are mild and days warm. Resolution of this problem in physical geography requires that the joint effect of snow and forest on the local climate be studied.

E. WILLARD MILLER—*Factors of Localization of Manufacturing in the Southern Anthracite Region of Pennsylvania*

The economy of the southern anthracite fields of Pennsylvania has long been based primarily on mining. However, for more than three decades now this area has been plagued by unemployment. This fact indicates that the region is undergoing structural changes to which it has been unable to adjust. Thus, a basic question is, how can a stable economy evolve from one which is based on the ephemeral production of minerals?

It is the purpose of this paper to analyze the localization of manufacturing in an area which has long been dominated by mining. Textile and apparel industries have developed as the dominant type of manufacturing in order to utilize the cheap available woman labor of the region. However, these industries are unstable, as shown by the migration of the basic textiles and frequent failures of the apparel companies. In recent decades, with an expanding supply of men in the labor force, there have been attempts to increase industries which would employ this source

of labor. Consequently, metal fabricating industries are increasing, but they are far below the textile and apparel industries as a source of employment. Other industries are insignificant in their development.

Localization of manufacturing in the southern anthracite region is analyzed as to labor supply, availability of raw materials, effects of unionization, competitive position of the region, influences of a coal mining landscape, and local development plans. While manufacturing employment is increasing, basic problems persist, as shown by continuing high unemployment, significant industrial migration, lack of new construction, general labor discontent, and great loss of population.

HOWARD J. NELSON—*The Sites of American Cities—A Historical Survey*

The choice of city sites must rank among man's most important decisions because of their general permanence when once established and because of the large proportion of the population that live in modern cities. In most parts of the world the circumstances surrounding the founding of cities are forever lost in the misty past of myth and legend. However, in the United States the great cities have been created within the last few centuries and investigation is possible.

In many instances city sites were deliberately selected by individuals or groups; in other instances the action was more roundabout. One period of American development appears to have spawned speculators and promotors who were "professional" town founders. Numerous present cities owe their sites to this group. Locating commissioners chose a second group of urban sites. Still another category of sites, perhaps most numerous of all, are those selected first as spots for trading posts, military forts, etc., and these installations in turn sited cities.

The sites upon which successful cities have actually appeared are widely varied. However, the description of Philadelphia's site as "having a high and dry bank near water" is typical. Perhaps river terraces or bluffs, stream junctions, harbors, portages, and railroad junctions account for the most numerous sites. Correlations with region and era seem apparent.

Qualities of the sites of our present cities apparent to the founder were appropriate to the day. These included ease of defense, high ground, level land, a suitable spring, proximity of navigable water, absence (or sometimes presence) of Indians, and relationship to treaty or property lines.

The decisions of a few score men, based in part on qualities no longer significant, and taken several hundred years ago, still exercise an intimate effect on the lives of many millions of Americans who live in large cities.